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LEADED RESISTORS
2008

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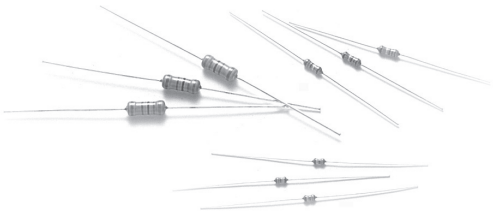
Metal Film Resistors

MFR Type

Normal & Miniature Style [MFR Series]



FEATURES

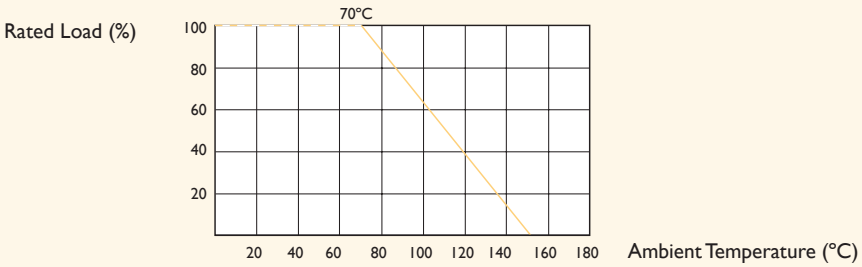
Power Rating	1/6W, 1/4W, 1/2W, 1W, 2W, 3W
Resistance Tolerance	±0.5%, ±1%
T.C.R.	±15ppm/°C, ±25ppm/°C, ±50ppm/°C, ±100ppm/°C

INTRODUCTION

The MFR Series Metal Film Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of blue color lacquer.

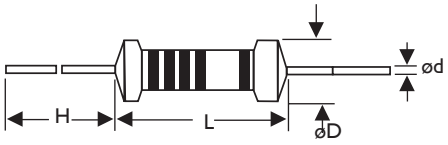
DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



STYLE		DIMENSION			
Normal	**Miniature**	**L**	**øD**	**H**	**ød**
MFR-12	MFR25S	3.4±0.3	1.9±0.2	28±2.0	0.45±0.05
MFR-25	MFR50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
MFR-50	MFR1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
MFR100	MFR2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
MFR200	MFR3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	MFR-12	MFR25S	MFR-25	MFR50S	MFR-50	MFR1WS	MFR100	MFR2WS	MFR200	MFR3WS
Power Rating at 70°C	1/6W	1/4W		1/2W		1W		2W		3W
Maximum Working Voltage	200V		250V	300V	350V	400V	500V			
Maximum Overload Voltage	400V		500V	600V	700V	800V	1000V			
Dielectric Withstanding Voltage	300V	400V	500V			700V	1000V			
Resistance Range	1Ω ~ 10MΩ & 0Ω for E24 & E96 series value									
Operating Temp. Range	- 55°C to + 155°C									
Temperature Coefficient	±15ppm/°C, ±25ppm/°C, ±50ppm/°C, ±100ppm/°C									

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

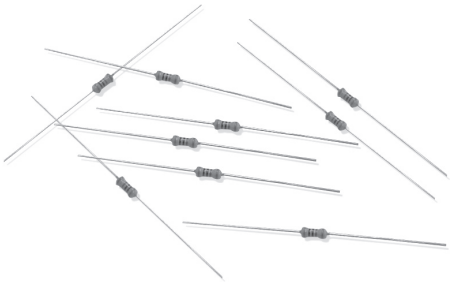
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.25%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±1.5%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±1.5%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±0.75%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±0.25%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Metal Film Resistors

Precision Type

Normal & Miniature Style [MFP Series]



INTRODUCTION

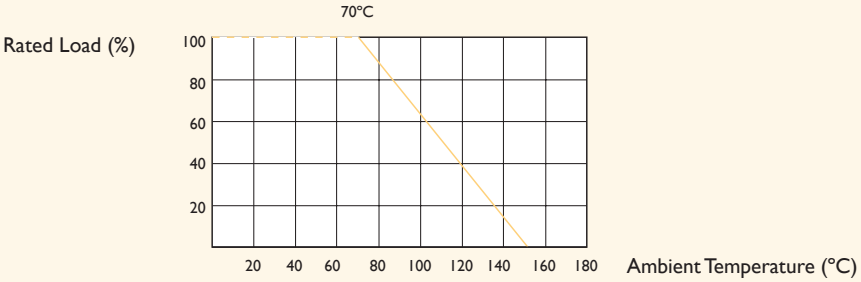
The MFP Series Metal Film Precision Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of blue color lacquer. Ultra high precision resistors, ultra high stability, ultra low temperature coefficient.

FEATURES

Power Rating	1/6W, 1/4W, 0.4W, 1/2W, 0.6W, 1W, 2W, 3W
Resistance Tolerance	±0.1%, ±0.25%
T.C.R.	±15ppm/°C, ±25ppm/°C

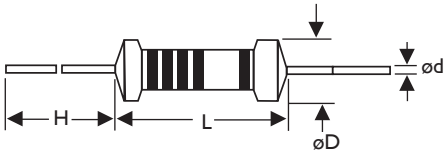
DERATING CURVE

For resistors operated in ambient temperatures above 70°C , power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



STYLE		DIMENSION			
Normal	**Miniature**	**L**	**øD**	**H**	**ød**
MFP-12	MFP25S	3.4±0.3	1.9±0.2	28±2.0	0.45±0.05
MFP204	-	3.4±0.3	1.9±0.2	28±2.0	0.45±0.05
MFP-25	MFP50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
MFP207	-	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
MFP-50	MFP1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
MFP100	MFP2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
MFP200	MFP3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	MFP-12	MFP25S	MFP204	MFP-25	MFP50S	MFP207	MFP-50	MFP1WS	MFP100	MFP2WS	MFP200	MFP3WS
Power Rating at 70 °C	1/6W	1/4W	0.4W	1/4W	1/2W	0.6W	1/2W	1W		2W		3W
Maximum Working Voltage	150V	200V		250V			350V	400V	500V			
Maximum Overload Voltage	300V	400V		500V	600V		700V	800V	1000V			
Dielectric Withstanding Vol.	300V			500V				700V	1000V			
Resistance Range	1Ω ~ 10MΩ & 0Ω for E192 series value											
Operating Temp. Range	- 55°C to + 155°C											
Temperature Coefficient	±15ppm/°C , ±25ppm/°C											

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

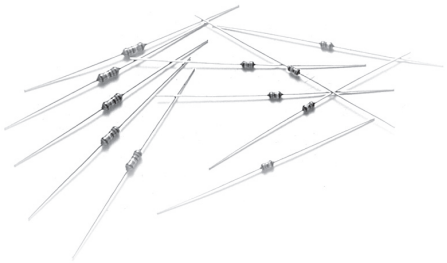
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.1%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±1.0%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±1.0%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±0.25%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±0.25%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Metal Film Resistors

Professional Type

Miniature Style [MF0 Series]



INTRODUCTION

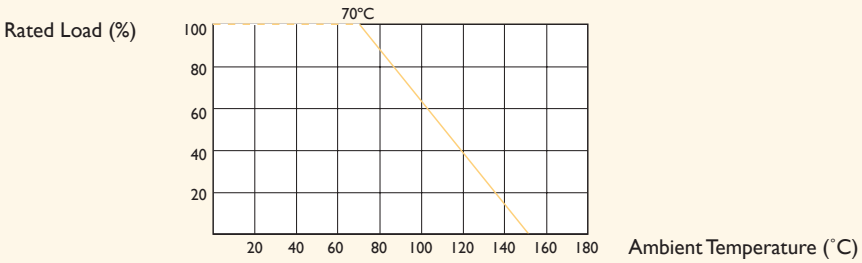
The MF0 Series Metal Film Professional Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of blue color lacquer.

FEATURES

Power Rating	0.4W, 0.6W
Resistance Tolerance	±1%
T.C.R.	±50ppm/°C

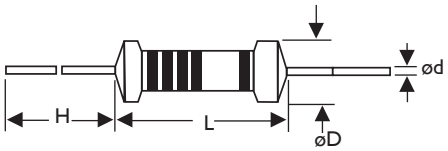
DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



STYLE	DIMENSION			
Miniature	**L**	**øD**	**H**	**ød**
MF0204	3.4±0.3	1.9±0.2	28±2.0	0.45±0.05
MF0207	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	MF0204	MF0207
Power Rating at 70 °C	0.4W	0.6W
Maximum Working Voltage	250V	350V
Maximum Overload Voltage	500V	700V
Dielectric Withstanding Voltage	300V	500V
Resistance Range	1Ω ~ 10MΩ & 0Ω for E24 & E96 series value	
Operating Temp. Range	- 55°C to + 155°C	
Temperature Coefficient	±50ppm/°C	

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

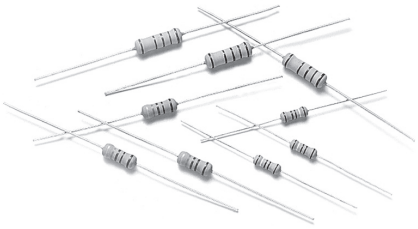
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.25%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±1.5%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±1.5%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±0.75%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±0.25%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Metal Film Resistors

Flame-Proof Type

Normal & Miniature Style [FMF Series]



FEATURES

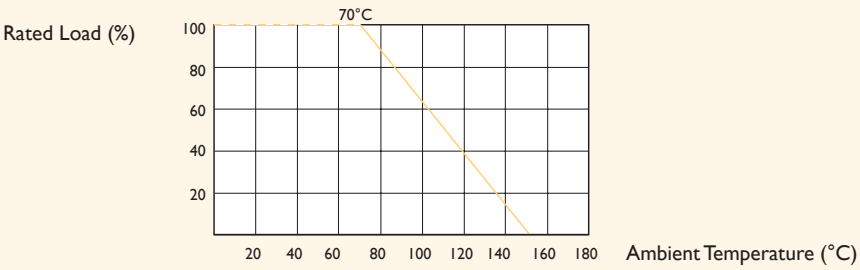
Power Rating	1/4W, 1/2W, 1W, 2W, 3W
Resistance Tolerance	±1%
T.C.R.	±50ppm/°C, ±100ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

INTRODUCTION

The FMF Series Flame Proof Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of gray color lacquer.

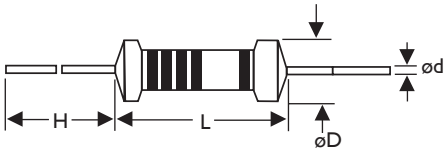
DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



STYLE		DIMENSION			
Normal	**Miniature**	**L**	**øD**	**H**	**ød**
FMF-25	FMF50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
FMF-50	FMF1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
FMF100	FMF2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
FMF200	FMF3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	FMF-25	FMF50S	FMF-50	FMF1WS	FMF100	FMF2WS	FMF200	FMF3WS
Power Rating at 70 °C	1/4W	1/2W		1W		2W		3W
Maximum Working Voltage	250V	300V	350V	400V	500V			
Maximum Overload Voltage	500V	600V	700V	800V	1000V			
Dielectric Withstanding Voltage	400V		500V	600V	750V			
Resistance Range	1Ω ~ 10MΩ & 0Ω for E24 & E96 series value							
Operating Temp. Range	- 55°C to + 155°C							
Temperature Coefficient	±50ppm/°C , ±100ppm/°C							

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

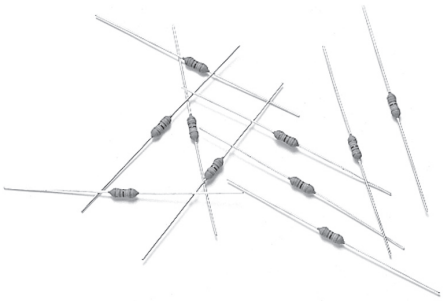
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.25%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±1.5%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±1.5%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±0.75%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±0.25%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Metal Film Resistors

Professional & Flame-Proof Type

Miniature Style [FM0 Series]



INTRODUCTION

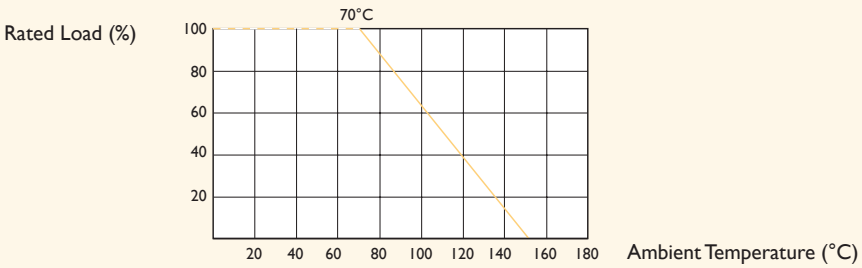
The FM0 Series Metal Film Professional & Flame Proof Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of light green color lacquer.

FEATURES

Power Rating	0.4W, 0.6W
Resistance Tolerance	±1%
T.C.R.	±50ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

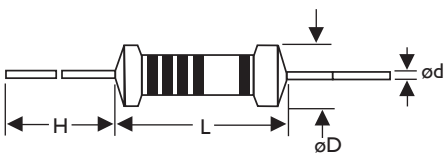
DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



STYLE	DIMENSION			
Miniature	**L**	**øD**	**H**	**ød**
FM0204	3.4±0.3	1.9±0.2	28±2.0	0.45±0.05
FM0207	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	FM0204	FM0207
Power Rating at 70 °C	0.4W	0.6W
Maximum Working Voltage	200V	300V
Maximum Overload Voltage	400V	600V
Dielectric Withstanding Voltage	300V	500V
Resistance Range	1Ω ~ 10MΩ & 0Ω for E24 & E96 series value	
Operating Temp. Range	- 55°C to + 155°C	
Temperature Coefficient	±50ppm/°C	

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

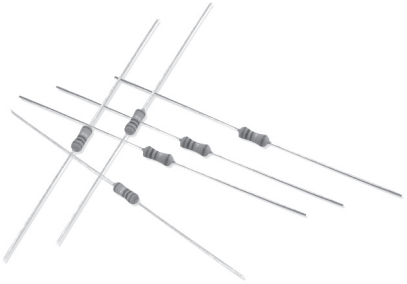
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.25%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±1.5%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±1.5%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±0.75%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±0.25%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Metal Film Resistors

Flame-Proof Type

High Power Style [FMP Series]



INTRODUCTION

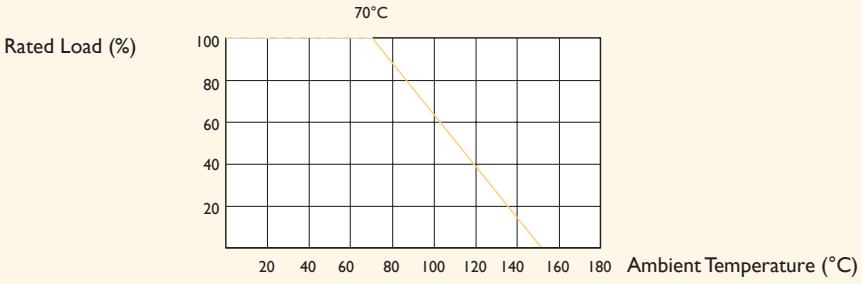
The FMP Series Metal Film Power Flame Proof Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of pink color lacquer.

FEATURES

Power Rating	1/2W, 1W, 2W, 3W
Resistance Tolerance	±1%, ±5%
T.C.R.	±100ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

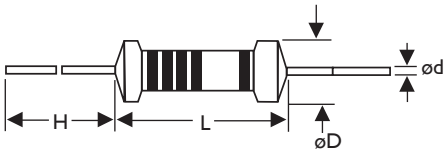
DERATING CURVE

For resistors operated in ambient temperatures above 70°C , power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



STYLE	DIMENSION			
Ultra Miniature	**L**	**øD**	**H**	**ød**
FMP-50	3.4±0.3	1.9±0.2	28±2.0	0.45±0.05
FMP100	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
FMP200	9.0±0.5	3.9±0.3	26±2.0	0.55±0.05
FMP300	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	FMP-50	FMP100	FMP200	FMP300
Power Rating at 70 °C	1/2W	1W	2W	3W
Maximum Working Voltage	200V	350V	500V	750V
Maximum Overload Voltage	400V	600V	700V	1000V
Dielectric Withstanding Voltage	300V	500V		750V
Resistance Range	1Ω ~ 10MΩ & 0Ω for E24 & E96 series value			
Operating Temp. Range	- 55°C to + 155°C			
Temperature Coefficient	±100ppm/°C			

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

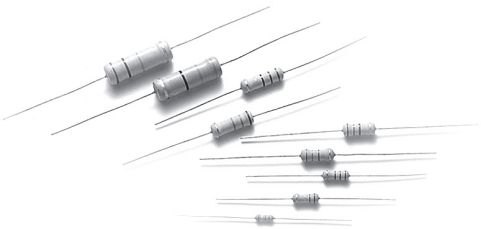
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.5%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±2.0%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±2%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1.0%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±0.25%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Metal Oxide Film Resistors

Flame-Proof Type

Normal & Miniature Style [RSF Series]



FEATURES

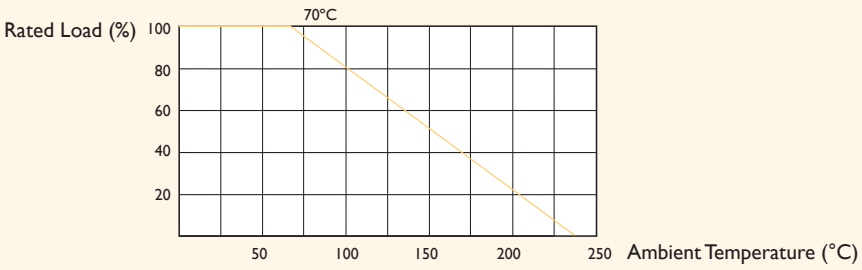
Power Rating	1/4W, 1/2W, 1W, 2W, 3W, 5W
Resistance Tolerance	±2%, ±5%
T.C.R.	±300ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

INTRODUCTION

The RSF Series Metal Oxide Film Flame Proof Resistors offer excellent performance in applications where stability and uniformity of characteristics are desired. They provide lower cost alternatives to Carbon Composition Resistors and General Purpose Metal Films. Metal Oxides also can replace many low power General Purpose wirewound applications, saving both money and time, with shorter delivery cycles. The normal style & the miniature style of RSF series are coated with layers of gray and pink colors flame proof lacquer respectively.

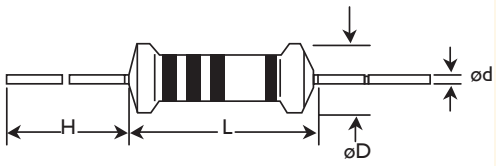
DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



STYLE		DIMENSION			
Normal	**Miniature**	**L**	**øD**	**H**	**ød**
RSF-25	RSF50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
RSF-50	RSF1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
RSF100	RSF2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
RSF200	RSF3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05
RSF3WM	RSF5SS	17.5±1.0	6.5±1.0	32±2.0	0.8±0.05
RSF300	RSF5WS	24.5±1.0	8.5±1.0	38±2.0	0.8±0.05
RSF500	-	24.5±1.0	8.5±1.0	38±2.0	0.8±0.05

* RSF1WS (for MB Type) ød=0.8±0.05mm

ELECTRICAL CHARACTERISTICS

NORMAL STYLE

STYLE	RSF-25	RSF-50	RSF100	RSF200	RSF3WM	RSF300	RSF500
Power Rating at 70 °C	1/4W	1/2W	1 W	2 W	3W		5 W
Maximum Working Voltage	200V	250V	350V		450V	500V	750V
Maximum Overload Voltage	300V	400V	600V		700V	800V	1000V
Dielectric Withstanding Voltage	250V	350V	500V		600V	700V	750V
Resistance Range	1Ω ~ 1MΩ & 0Ω for E24 series value						
Operating Temp. Range	- 55°C to + 155°C						
Temperature Coefficient	±300ppm/°C						

MINIATURE STYLE

STYLE	RSF50S	RSF1WS	RSF2WS	RSF3WS	RSF5SS	RSF5WS
Power Rating at 70 °C	1/2W	1 W	2 W	3W	5 W	
Maximum Working Voltage	250V	300V	350V		500V	750V
Maximum Overload Voltage	400V	500V	600V		800V	1000V
Dielectric Withstanding Voltage	350V	400V	500V		700V	750V
Resistance Range	1Ω ~ 1MΩ & 0Ω tor E24 series value					
Operating Temp. Range	- 55°C to + 155°C					
Temperature Coefficient	±300ppm/°C					

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

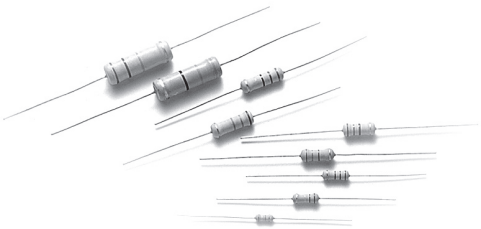
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(1.0%+0.05Ω) for normal style ±(2.0%+0.05Ω) for miniature style
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1,000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±2.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,0000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±5%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Metal Oxide Film Resistors
Low Inductive

Flame-Proof Type

Normal & Miniature Style [LIR Series]



INTRODUCTION

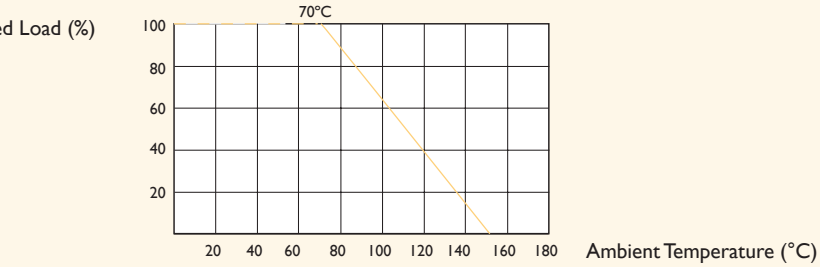
The LIR Series Metal Oxide Film Flame Proof Low Inductive Resistors offer excellent performance in applications where stability and uniformity of characteristics are desired. They provide lower cost alternatives to Carbon Composition Resistors and General Purpose Metal Films. Metal Oxides also can replace many low power General Purpose wirewound applications, saving both money and time, with shorter delivery cycles. The normal style & the miniature style of LIR series are coated with layers of gray and pink colors flame proof lacquer respectively.

FEATURES

Power Rating	1/4W, 1/2W, 1W, 2W, 3W, 5W
Resistance Tolerance	±5%, ±10%
T.C.R.	±300ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

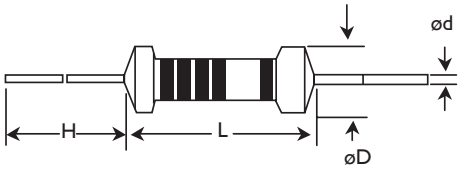
DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



The 5th is blue color band for LIR series

STYLE		DIMENSION			
Normal	**Miniature**	**L**	**øD**	**H**	**ød**
LIR-25	LIR50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
LIR-50	LIR1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
LIR100	LIR2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
LIR200	LIR3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05
LIR3WM	LIR5SS	17.5±1.0	6.5±1.0	32±2.0	0.8±0.05
LIR300	LIR5WS	24.5±1.0	8.5±1.0	38±2.0	0.8±0.05
LIR500	-	24.5±1.0	8.5±1.0	38±2.0	0.8±0.05

* LIR1WS (for MB Type) ød = 0.8±0.05 mm

ELECTRICAL CHARACTERISTICS

NORMAL STYLE

STYLE	LIR-25	LIR-50	LIR100	LIR200	LIR3WM	LIR300	LIR500
Power Rating at 70 °C	1/4W	1/2W	1 W	2 W	3W		5 W
Maximum Working Voltage	200V	250V	350V		450V	500V	750V
Maximum Overload Voltage	300V	400V	600V		700V	800V	1000V
Dielectric Withstanding Voltage	250V	350V	500V		600V	700V	750V
Resistance Range	1 Ω ~ 100KΩ & 0Ω for E24 resistance value						
Operating Temp. Range	- 55°C to + 155°C						
Temperature Coefficient	±300ppm/°C						

MINIATURE STYLE

STYLE	LIR50S	LIR1WS	LIR2WS	LIR3WS	LIR5SS	LIR5WS
Power Rating at 70 °C	1/2W	1 W	2 W	3W	5 W	
Maximum Working Voltage	250V	300V	350V		500V	750V
Maximum Overload Voltage	400V	500V	600V		800V	1000V
Dielectric Withstanding Voltage	350V	400V	500V		700V	750V
Resistance Range	1 Ω ~ 100KΩ & 0Ω for E24 resistance value					
Operating Temp. Range	- 55°C to + 155°C					
Temperature Coefficient	±300ppm/°C					

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

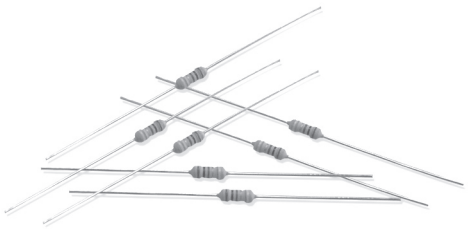
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(1.0%+0.05Ω) for normal style ±(2.0%+0.05Ω) for miniature style
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±2.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±5%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Metal Film Resistors

Fusible Type

Normal & Miniature Style [FRM Series]



INTRODUCTION

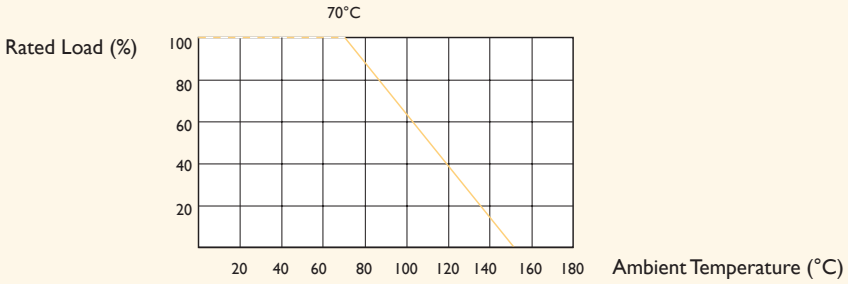
The FRM Series Metal Film Fusible Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of gray color lacquer for normal size & pink color lacquer for miniature size. Overload protection without risk of fire. Wide range of overload currents.

FEATURES

Power Rating	1/4W, 1/2W, 1W, 2W, 3W
Resistance Tolerance	±2%, ±5%
T.C.R.	±200ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

DERATING CURVE

For resistors operated in ambient temperatures above 70°C , power ratingmust be derated in accordance with the curve below.

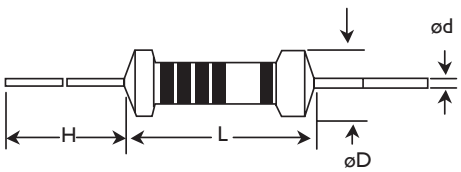


FUSING CHARACTERISTICS

R<2.0 Ω Fusing time within 30 seconds at 25 times of rated power
R>2.2 Ω Fusing time within 30 seconds at 16 times of rated power
Fusing residual resistive value at least 100 times rated resistance

DIMENSIONS

Unit : mm



The 5th is white color band for FRM series

STYLE		DIMENSION			
Normal	**Miniature**	**L**	**øD**	**H**	**ød**
FRM-25	FRM50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
FRM-50	FRM1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
FRM100	FRM2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
FRM200	FRM3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	FRM-25	FRM50S	FRM-50	FRM1WS	FRM100	FRM2WS	FRM200	FRM3WS
Power Rating at 70 °C	1/4W	1/2W		1W		2W		3W
Maximum Working Voltage	200V		250V		300V		350V	
Maximum Overload Voltage	400V		500V		600V		700V	
Dielectric Withstanding Voltage	250V				350V			
Resistance Range	4.7Ω ~ 560Ω (± 2%) for E24 series value & 2.2Ω ~ 560Ω (± 5%) for E24 series value							
Operating Temp. Range	- 55°C to + 155°C							
Temperature Coefficient	±200ppm/°C							

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2.0%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5.0%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±5.0%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±2.0%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1.0%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Melf Metal Film Resistors

MMF Type

Normal & Miniature Style [MMF Series]

INTRODUCTION

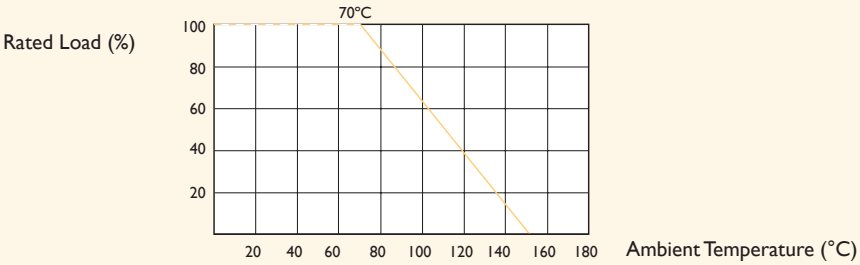
The MMF Series Melf Metal Film Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, SMD enabled structure. The resistors are coated with layers of blue color lacquer.

FEATURES

Power Rating	1/6W, 1/4W, 0.4W, 1/2W, 0.6W, 1W
Resistance Tolerance	±0.1%, ±0.25%, ±0.5%, ±1%
T.C.R.	±15ppm/°C, ±25ppm/°C, ±50ppm/°C, ±100ppm/°C, ±200ppm/°C

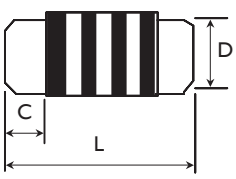
DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



STYLE		DIMENSION		
Normal	**Miniature**	**L**	**D**	**C**
MMF-12	MMF25S / MMF204	3.45±0.1	1.35±0.1	0.6
MMF-25	MMF50S / MMF207	5.90± 0.2	2.20±0.1	1.0
MMF-50	MMF1WS	8.50± 1.0	3.00±0.2	1.3

Note :

ELECTRICAL CHARACTERISTICS

STYLE	MMF-12	MMF25S	MMF204	MMF-25	MMF50S	MMF207	MMF-50	MMF1WS
Power Rating at 70 °C	1/6W	1/4W	0.4W	1/4W	1/2W	0.6W	1/2W	1W
Maximum Working Voltage	200V			300V			350V	
Maximum Overload Voltage	400V			500V			700V	
Dielectric Withstanding Voltage	300V			500V			700V	
Resistance Range	10Ω ~ 1MΩ & 0Ω for E96 & E192 series value							
Operating Temp. Range	- 55°C to + 125°C							
Temperature Coefficient	±15ppm/°C, ±25ppm/°C , ±50ppm/°C , ±100ppm/°C, ±200ppm/°C							

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.25%+0.05Ω) for normal size ±(0.5%+0.05Ω) for miniature size
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±2%+0.1Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±2.0%+0.1Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±0.75%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±0.5%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Melf Metal Film Resistors

MMP Type

High Power Style [MMP Series]

INTRODUCTION

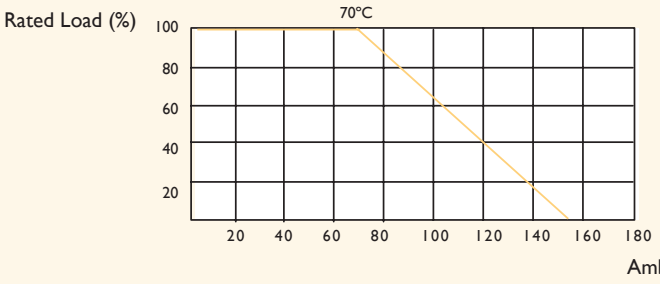
The MMP Series Melf Metal Film High Powe Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, SMD enabled structure and high power in small packages. The resistors are coated with layers of pink color lacquer.

FEATURES

Power Rating	1W, 2W
Resistance Tolerance	±1%, ±2%, ±5%
T.C.R.	±50ppm/°C, ±100ppm/°C, ±200ppm/°C

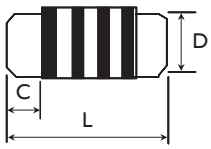
DERATING CURVE

For resistors operated in ambient temperatures above 70°C , power ratingmust be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



STYLE	DIMENSION		
Ultra Miniature	**L**	**D**	**C**
MMP100	5.9±0.2	2.2±0.1	1.0
MMP200	8.5±1.0	3.0±0.2	1.3

Note :

ELECTRICAL CHARACTERISTICS

STYLE	MMP100	MMP200
Power Rating at 70 °C	1W	2W
Maximum Working Voltage	300V	350V
Maximum Overload Voltage	600V	700V
Dielectric Withstanding Voltage	500V	700V
Resistance Range	10Ω ~ 1MΩ & 0Ω for E24 & E96 series value	
Operating Temp. Range	- 55°C to + 155°C	
Temperature Coefficient	±50ppm/°C, ±100ppm/°C, ±200ppm/°C	

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

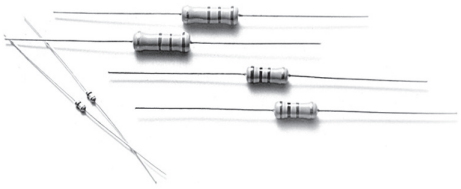
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.25%+0.05Ω) for normal size ±(0.5%+0.05Ω) for miniature size
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±2%+0.1Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±2%+0.1Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±0.75%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±0.5%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Carbon Film Resistors

CFR Type

Normal & Miniature Style [CFR Series]



INTRODUCTION

The CFR Series Carbon Film Resistors are manufactured by coating a homogeneous film of pure carbon on high grade ceramic rods. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of tan color lacquer.

FEATURES

Power Rating	1/6W, 1/4W, 1/2W, 1W, 2W, 3W
Resistance Tolerance	±2%, ±5%
T.C.R.	see Table 1

DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.

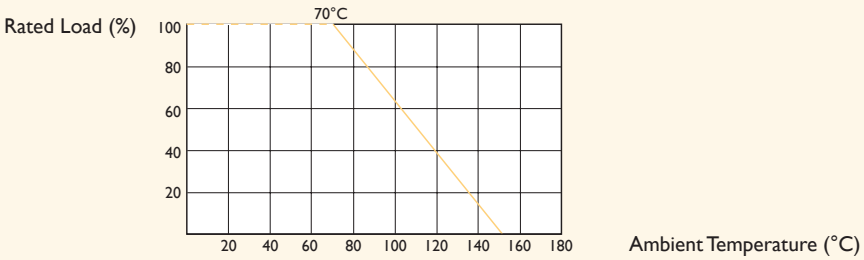
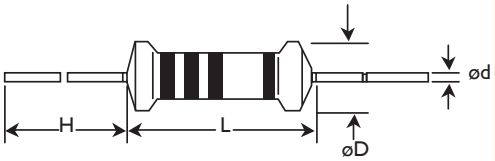


TABLE 1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/°C		
	under 100KΩ	100KΩ ~ 1MΩ	1MΩ ~ 10MΩ
CFR100, CFR200, CFR2WS, CFR3WS	±350	-500	-1500
CFR-12, CFR-25, CFR-50, CFR25S, CFR50S, CFR1WS	+350 - 500	-700	-1500

DIMENSIONS

Unit : mm



STYLE		DIMENSION			
Normal	Miniature	L	øD	H	ød
CFR-12	CFR25S	3.4±0.3	1.9±0.2	28±2.0	0.45±0.05
CFR-25	CFR50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
CFR-50	CFR1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
CFR100	CFR2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
CFR200	CFR3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	CFR-12	CFR25S	CFR-25	CFR50S	CFR-50	CFR1WS	CFR100	CFR2WS	CFR200	CFR3WS
Power Rating at 70 °C	1/6W	1/4W		1/2W		1W		2W		3W
Maximum Working Voltage	150V	200V	250V	300V	350V	400V	500V			
Maximum Overload Voltage	300V	400V	500V	600V	700V	800V	1000V			
Dielectric Withstanding Voltage	300V	400V	500V			700V	1000V			
Resistance Range	1Ω ~ 10MΩ & 0Ω for E24 series value									
Operating Temp. Range	-55°C to + 155°C									
Temperature Coefficient	see Table 1									

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

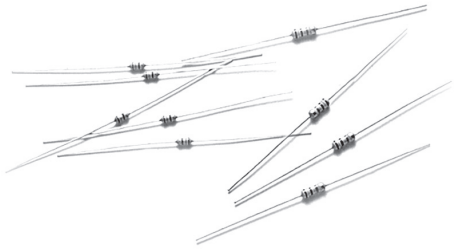
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.75%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±3%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±3%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Carbon Film Resistors

Professional Type

Miniature Style [CF0 Series]



INTRODUCTION

The CF0 Series Carbon Film Professional Resistors are manufactured by coating a homogeneous film of pure carbon on high grade ceramic rods. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of tan color lacquer.

FEATURES

Power Rating	0.4W, 0.6W
Resistance Tolerance	±2%,±5%
T.C.R.	see Table 1

DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.

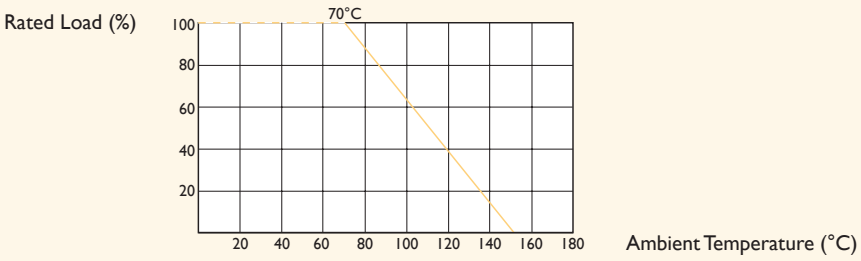
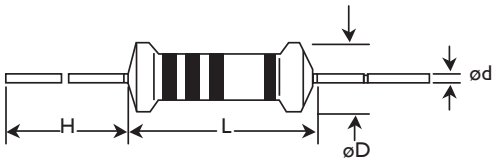


TABLE 1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/°C		
	under 100KΩ	100KΩ ~ 1MΩ	1MΩ ~ 10MΩ
CF0204, CF0207	+350 -500	-700	-1500

DIMENSIONS

Unit : mm



STYLE	DIMENSION			
Miniature	L	øD	H	ød
CF0204	3.4±0.3	1.9±0.2	28±2.0	0.45±0.05
CF0207	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	CF0204	CF0207
Power Rating at 70 °C	0.4W	0.6W
Maximum Working Voltage	200V	300V
Maximum Overload Voltage	400V	600V
Dielectric Withstanding Voltage	300V	500V
Resistance Range	1Ω ~ 10MΩ & 0Ω for E24 series value	
Operating Temp. Range	- 55°C to + 155°C	
Temperature Coefficient	see Table 1	

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

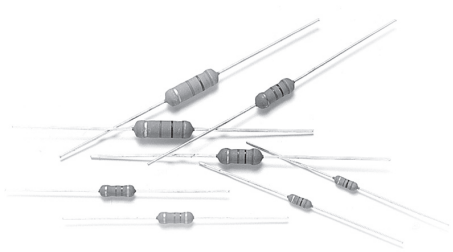
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.75%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±3%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±3%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Carbon Film Resistors

Flame-Proof Type

Normal & Miniature Style [FCR Series]



INTRODUCTION

The FCR Series Carbon Film Flame Proof Resistors are manufactured by coating a homogeneous film of pure carbon on high grade ceramic rods. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of gray color lacquer.

FEATURES

Power Rating	1/4W, 1/2W, 1W, 2W, 3W
Resistance Tolerance	±2%,±5%
T.C.R.	see Table 1
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.

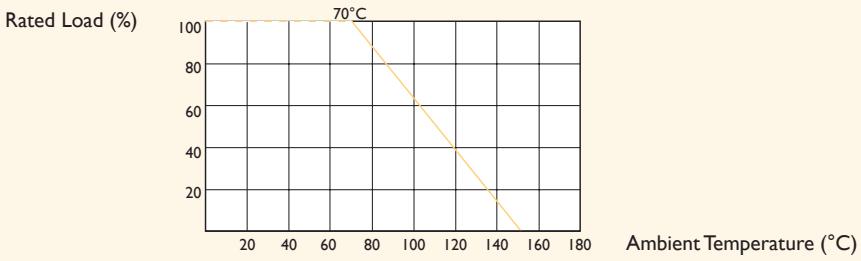
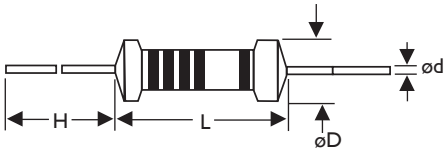


TABLE1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/°C		
	under 100KΩ	100KΩ ~ 1MΩ	1MΩ ~ 10MΩ
FCR100, FCR200, FCR2WS, FCR3WS	±350	-500	-1500
FCR-25, FCR-50, FCR50S, FCR1WS	+350 -500	-700	-1500

DIMENSIONS

Unit : mm



The 5th is black color band for FCR series

STYLE		DIMENSION			
Normal	Miniature	L	øD	H	ød
FCR-25	FCR50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
FCR-50	FCR1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
FCR100	FCR2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
FCR200	FCR3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	FCR-25	FCR50S	FCR-50	FCR1WS	FCR100	FCR2WS	FCR200	FCR3WS
Power Rating at 70 °C	1/4W	1/2W		1W		2W		3W
Maximum Working Voltage	250V	300V	350V	400V	500V			
Maximum Overload Voltage	500V	600V	700V	800V	1000V			
Dielectric Withstanding Voltage	400V		500V	600V	750V			
Resistance Range	1Ω ~ 10MΩ & 0Ω for E24 series value							
Operating Temp. Range	- 55°C to + 155°C							
Temperature Coefficient	see Table 1							

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

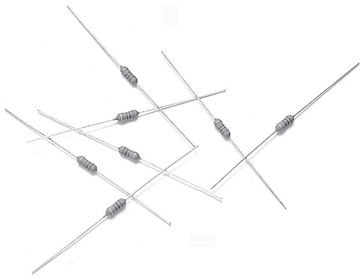
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.75%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	- 55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±3%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±3%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Carbon Film Resistors

Professional & Flame-Proof Type

Miniature Style [FC0 Series]



INTRODUCTION

The FC0 Series Carbon Film Professional & Flame Proof Resistors are manufactured by coating a homogeneous film of pure carbon on high grade ceramic rods. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of green color lacquer.

FEATURES

Power Rating	0.4W, 0.6W
Resistance Tolerance	±2%,±5%
T.C.R.	see Table 1
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.

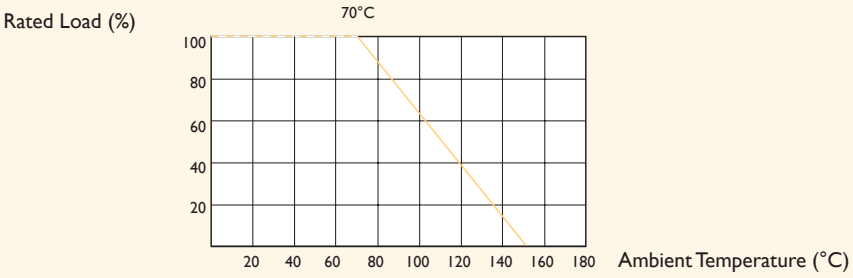
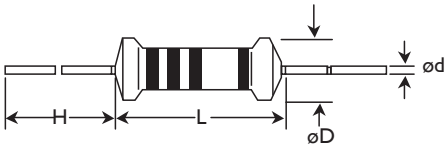


TABLE 1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/°C		
	under 100KΩ	100KΩ ~ 1MΩ	1MΩ ~ 10MΩ
FC0204, FC0207	+350 -500	-700	-1500

DIMENSIONS

Unit : mm



STYLE	DIMENSION			
Miniature	L	øD	H	ød
FC0204	3.4±0.3	1.9±0.2	28±2.0	0.45±0.05
FC0207	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	FC0204	FC0207
Power Rating at 70 °C	0.4W	0.6W
Maximum Working Voltage	200V	300V
Maximum Overload Voltage	400V	600V
Dielectric Withstanding Voltage	300V	500V
Resistance Range	1Ω ~ 10MΩ & 0Ω for E24 series value	
Operating Temp. Range	- 55°C to + 155°C	
Temperature Coefficient	see Table 1	

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.75%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	- 55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±3%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±3%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Carbon Film Resistors

Non Inductive Type

Normal & Miniature Style [NCR Series]

INTRODUCTION

The NCR Series Carbon Film Non Inductive Flame Proof Resistors are manufactured by coating a homogeneous film of pure carbon on high grade ceramic rods. Tinned connecting leads of electrolytic copper are welded to the end-caps. The Inductance is $<1\mu H$.

The resistors are coated with layers of gray color lacquer for normal size & pink color lacquer for miniature size.

FEATURES

Power Rating	1/4W, 1/2W, 1W, 2W, 3W
Resistance Tolerance	±5%, ±10%
T.C.R.	see Table 1
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.

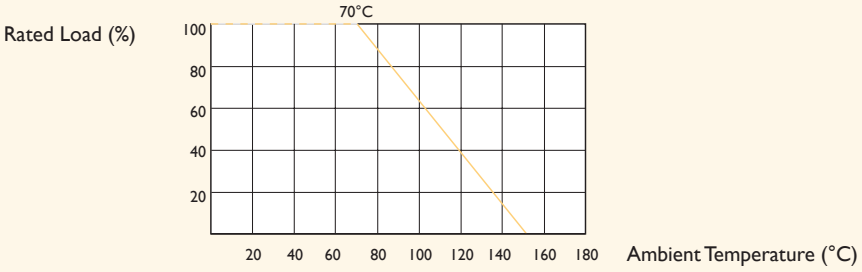
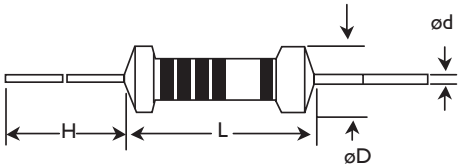


TABLE 1 TEMPERATURE COEFFICIENT

VALUE RANGE	Max. Value of Temp. Coefficient ppm/°C
Under 5KΩ	-500
5K ~ 10KΩ	-800

DIMENSIONS

Unit : mm



The 5th is green color band for NCR series

STYLE		DIMENSION			
Normal	**Miniature**	**L**	**øD**	**H**	**ød**
NCR-25	NCR50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
NCR-50	NCR1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
NCR100	NCR2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
NCR200	NCR3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	NCR-25	NCR50S	NCR-50	NCR1WS	NCR100	NCR2WS	NCR200	NCR3WS
Power Rating at 70°C	1/4W	1/2W		1W		2W		3W
Maximum Working Voltage	250V	300V	350V	400V	500V			
Maximum Overload Voltage	500V	600V	700V	800V	1000V			
Dielectric Withstanding Voltage	500V		700V		1000V			
Resistance Range	2.2Ω~5KΩ for E24 series value							
Operating Temp. Range	- 55°C to + 155°C							
Temperature Coefficient	see Table 1							

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.75%+0.05Ω) for normal style ±(2.0%+0.05Ω) for miniature style
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	- 55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles(1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs.(1.5 Hrs. on , 0.5 Hrs. off)	±3%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±3%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Melf Carbon Film Resistors

MCF Type

Normal & Miniature Style [MCF Series]

INTRODUCTION

The MCF Series Melf Carbon Film Resistors are manufactured by coating a homogeneous film of pure carbon on high grade ceramic rods. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. SMD enabled structure. The resistors are coated with layers of tan color lacquer.

FEATURES

Power Rating	1/6W, 1/4W, 0.4W, 1/2W, 0.6W, 1W
Resistance Tolerance	±2%, ±5%
T.C.R.	see Table 1

DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.

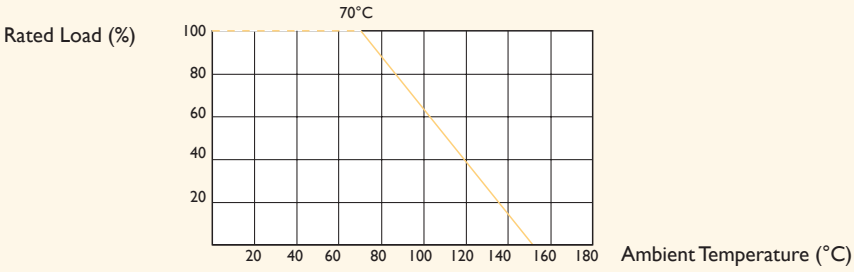
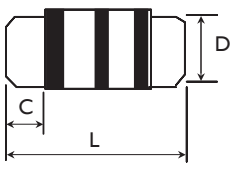


TABLE 1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/°C		
	under 10KΩ	11KΩ ~100KΩ	110KΩ ~1MΩ
MCF-12, MCF-204, MCF50S, MCF-50 MCF25S, MCF-25, MCF207, MCF1WS	+350 ~ -500	-700	-1500

DIMENSIONS



Unit : mm

STYLE		DIMENSION		
Normal	Miniature	L	D	C
MCF-12	MCF25S / MCF204	3.45 ± 0.1	1.35 ± 0.1	0.6
MCF-25	MCF50S / MCF207	5.90 ± 0.2	2.20 ± 0.1	1.0
MCF-50	MCF1WS	8.50 ±1.0	3.00 ±0.2	1.3

Note :

ELECTRICAL CHARACTERISTICS

STYLE	MCF-12	MCF25S	MCF204	MCF-25	MCF50S	MCF207	MCF-50	MCF1WS
Power Rating at 70 °C	1/6W	1/4W	0.4W	1/4W	1/2W	0.6W	1/2W	1W
Maximum Working Voltage	200V			300V	350V			
Maximum Overload Voltage	300V			600V			700V	
Dielectric Withstanding Voltage	200V			500V			700V	
Resistance Range	10Ω ~ 1MΩ & 0Ω for E24 series value							
Operating Temp. Range	- 55°C to + 155°C							
Temperature Coefficient	see Table 1							

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(1.0%+0.05Ω) for normal size
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	- 55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.1Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±3.0%+0.1Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±0.75%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Melf Carbon Film Resistors

MCP Type

High Power Style [MCP Series]

INTRODUCTION

The MCP Series Melf Carbon Film Resistors are manufactured by coating a homogeneous film of pure carbon on high grade ceramic rods. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. SMD enabled structure and high power in small packages. The resistors are coated with layers of pink color lacquer.

FEATURES

Power Rating	1W, 2W
Resistance Tolerance	±2%, ±5%
T.C.R.	see Table 1

DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.

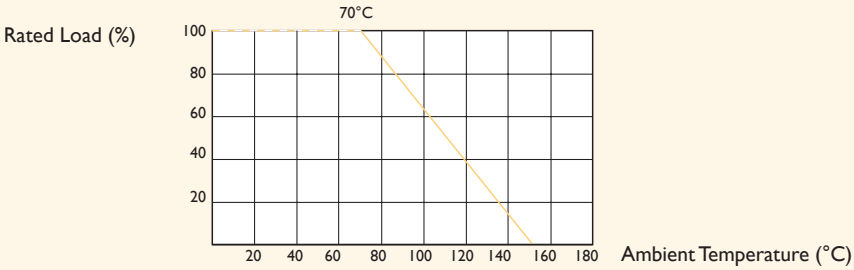
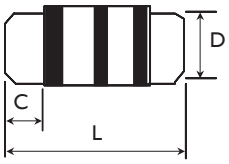


TABLE 1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/°C		
	under 10KΩ	11KΩ ~100KΩ	110KΩ ~1MΩ
MCP100, MCP200	+350 ~ -500	-700	-1500

DIMENSIONS

Unit : mm



STYLE	DIMENSION		
Ultra Miniature	L	D	C
MCP100	5.9±0.2	2.2±0.1	1.0
MCP200	8.5±1.0	3.0±0.2	1.3

Note :

ELECTRICAL CHARACTERISTICS

STYLE	MCP100	MCP200
Power Rating at 70°C	1W	2W
Maximum Working Voltage	300V	350V
Maximum Overload Voltage	600V	700V
Dielectric Withstanding Voltage	500V	700V
Resistance Range	10Ω ~ 1MΩ & 0Ω for E24 & E96 series value	
Operating Temp. Range	- 55°C to + 155°C	
Temperature Coefficient	See Table 1	

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

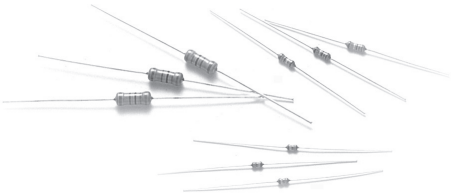
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(1.0%+0.05Ω) for normal size
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.1Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±3.0%+0.1Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±0.75%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

High Voltage Resistors

Flame-Proof Type

Normal Style [HVR Series]



FEATURES

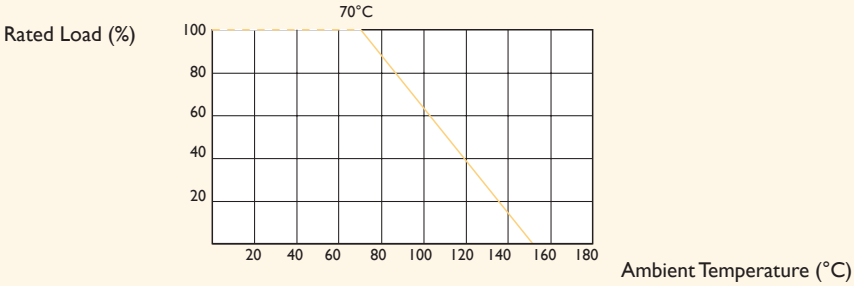
Power Rating	1/4W, 1/2W, 1W
Resistance Tolerance	±1%, ±5%
T.C.R.	±100ppm/°C, ±200ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

INTRODUCTION

The HVR Series High Voltage Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of gray color lacquer.

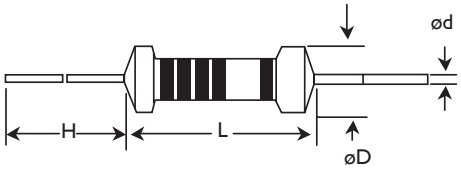
DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



The 5th is yellow color band for HVR 5% series

STYLE	DIMENSION			
Normal	**L**	**øD**	**H**	**ød**
HVR-25	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
HVR-50	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
HVR100	11.5±1.0	4.5±0.5	35±2.0	0.80±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	HVR-25	HVR-50	HVR100
Power Rating at 70°C	1/4W	1/2W	1W
Maximum Working Voltage (DC)	500V	1000V	1500V
Maximum Overload Voltage (DC)	700V	1500V	2500V
Dielectric Withstanding Voltage	500V	600V	800V
Resistance Range	33KΩ~10MΩ for E24 series value		
Operating Temp. Range	- 55°C to +155°C		
Temperature Coefficient	±100ppm/°C ; ±200ppm /°C		

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

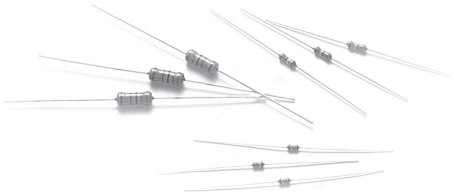
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	260°C±5°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±10%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5.0%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5.0%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1.0%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±1.0%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

High Voltage &
High Ohmic Resistors

Flame-Proof Type

Normal Style [HHV Series]



FEATURES

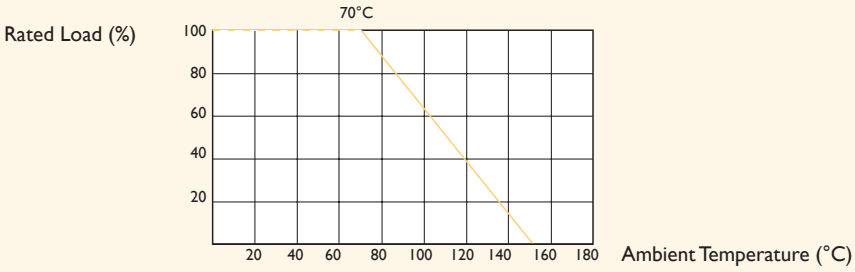
Power Rating	1/4W, 1/2W, 1W
Resistance Tolerance	±1%, ±5%
T.C.R.	±200ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

INTRODUCTION

The HHV Series High Voltage & High Ohmic Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals alloy and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of pink color lacquer.

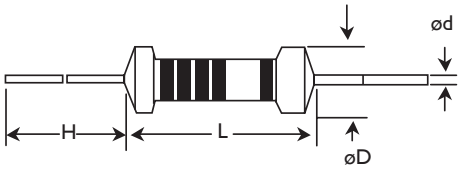
DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



The 5th is blue color band for HHV 5% series

STYLE	DIMENSION			
Normal	**L**	**øD**	**H**	**ød**
HHV-25	6.5±1.0	2.6±0.3	26±3.0	0.55±0.03
HHV-50	8.8±1.0	3.2±0.2	28±3.0	0.60±0.03
HHV100	15.5±1.0	5.5±0.5	30±3.0	0.8±0.03

Note :

ELECTRICAL CHARACTERISTICS

STYLE	HHV-25	HHV-50	HHV100
Power Rating at 70 °C	1/4W	1/2W	1W
Maximum Working Voltage (DC)	1600V	3500V	10000V
Maximum Overload Voltage (DC)	3000V	7000V	20000V
Dielectric Withstanding Voltage	500V	700V	
Resistance Range	100KΩ ~ 68MΩ for E24 series value		
Operating Temp. Range	- 55°C to + 155°C		
Temperature Coefficient	±200ppm/°C		

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

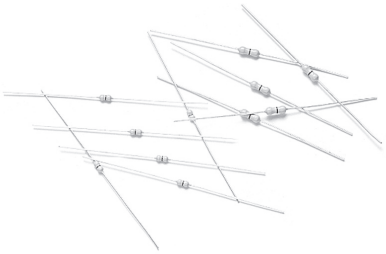
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±1%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5.0%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5.0%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1.0%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1.0%+0.05Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Zero Ohm Resistors

ZOR Type

Normal Style [ZOR Series]



INTRODUCTION

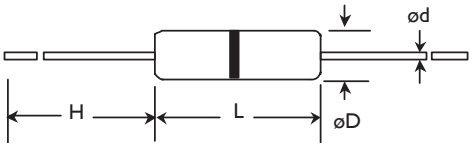
- Similar to a 1/4W resistor (1/6W size also available, typical resistance 0.004 Ω)
- Ideal for automatic insertion or Cut and Form
- Available in Tape/Reel, Tape/Box and Bulk
- Film type Zero Ohm also available in 1/4W (ZOR-25) and 1/6W (ZOR-12) size

SPECIFICATIONS

Power Rating	1/6W, 1/4W
Maximum Resistance	0.005 Ω
T.C.R.	±100ppm/°C
Min. Insulation Resistance	
Dry	10000M Ω
Wet	100M Ω
Min. Dielectric Withstanding Voltage	
Atmospheric	500V RMS
Reduced	325V RMS
Insulation Flammability	Resistor Insulation is Self Extinguishing within 10 Seconds After Externally Applied Flame is Removed
Current Rating	15 AMPS at 70°C for 1/4W 10 AMPS at 70°C for 1/6W

DIMENSIONS

Unit : mm



Single Black Color Band Denotes Zero Resistance

STYLE	DIMENSION			
Normal	**L**	**øD**	**H**	**ød**
ZOR-12	3.3±0.4	1.8±0.3	28±2.0	0.45±0.05
ZOR-25	6.3±0.5	2.3±0.3	28±2.0	0.55±0.05

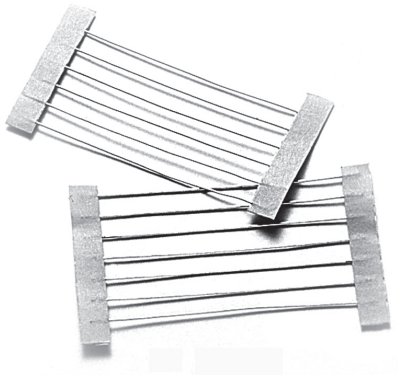
JPW Type

Normal Style [JPW Series]

Jumper Wires

SPECIFICATIONS

Material of Jumper Wire	Soft Copper Wire with Tin Plating		
Conductor Resistance	0.54mΩ/cm		
Wire Diameter	ø0.5、ø0.6、ø0.7、ø0.8、ø1.0(±0.05mm)		
Tension Strength	CNS 8938 within 28kg/mm^2		
Extension Rate	CNS 8938 ø0.5~ø0.6mm	over 24%	
	CNS 8938 ø0.7~ø1.0mm	over 26%	
Conductivity	ø0.5mm	Minmum 94%	
	ø0.6~ø1.0mm	Minmum 96%	
Twisting Strength	CNS 8938 ø0.5mm	Load 250 g	3 cycles
	CNS 8938 ø0.6~ø0.8mm	Load 500 g	3 cycles
	CNS 8938 ø1.0mm	Load 1.0 kg	3 cycles
Solderability	JIS-5012-C5033 260°C±5°C , 5±0.5 sec. Coverage 95%		
Element of Plating	JIS-H3101 Tin Minimum 99.9%		
Thickness of Plating	4μm±1μm		
Current Rating	ø0.5mm	6 AMPS at 70°C	
	ø0.6mm	7.5 AMPS at 70°C	
	ø0.7mm	8.5 AMPS at 70°C	
	ø0.8mm	10 AMPS at 70°C	
	ø1.0mm	15 AMPS at 70°C	
Appearance	Smooth and Shining		



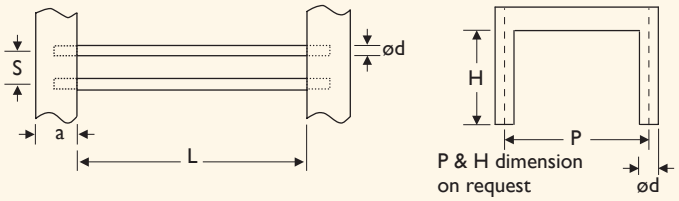
INTRODUCTION

Jumper wires or crossovers, as they are sometimes called, are basically interconnection devices between points on a P.C.Board. Generally they are used for the following reasons:

- Inability to connect two points on a P.C. Board due to other circuit paths which must be crossed over.
- An After-the-Fact design change that requires new point connections.
- Circuit tuning by changing point connections.

Jumper wires offers a quick simple solution to these problems. They are especially suited for automatic machine insertion on lead tape or available in all packaging styles including pre-cut and formed leads for manual insertion.

DIMENSIONS



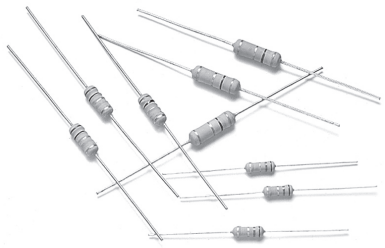
Unit : mm

STYLE	ød	L	S	a
JPW-05	0.5±0.05			
JPW-06	0.6±0.05	26.0±1.0		
JPW-07	0.7±0.05	52.4±1.0	5.0±0.1	6.0±0.5
JPW-08	0.8±0.05	73.0±1.5		
JPW-10	1.0±0.05			

Wire Wound Resistors

Flame-Proof Type

Normal & Miniature Style [KNP Series]



FEATURES

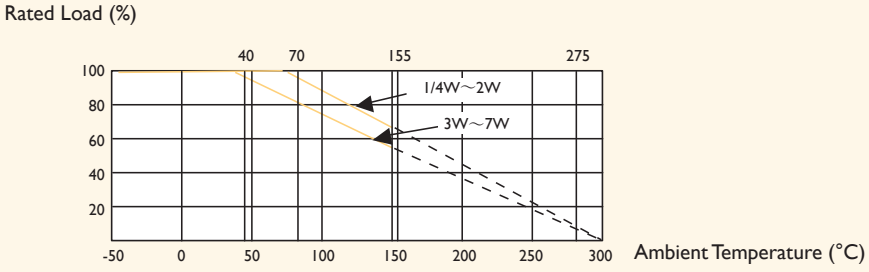
Power Rating	1/4W, 1/2W, 1W, 2W, 3W, 4W, 5W, 7W
Resistance Tolerance	±1%, ±5%
T.C.R.	±300ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

INTRODUCTION

The resistor element is a resistive wire which is wound in a single layer on a ceramic rod or fiber-glass, tinned connecting wires of electrolytic copper are welded to the end-caps. The ends of the resistance wire and the leads are connected to the caps by welding. The resistors are coated with layers of green color flame proof lacquer.

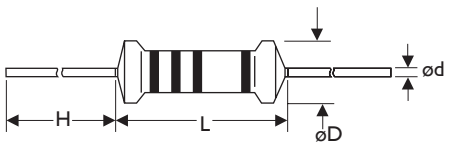
DERATING CURVE

For resistors operated in ambient temperatures above 20°C , power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



STYLE		DIMENSION			
Normal	**Miniature**	**L**	**øD**	**H**	**ød**
KNP-25	KNP50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
KNP-50	KNP1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
KNP100	KNP2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
KNP200	KNP3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05
KNP300	KNP5WS	17.5±1.0	6.5±0.5	32±2.0	0.8±0.05
KNP400					
KNP500	KNP7WS	24.5±1.0	8.0±0.5	38±2.0	0.8±0.05
KNP700	-	24.5±1.0	8.0±0.5	38±2.0	0.8±0.05

* KNP1WS (for MB Type) ød = 0.8±0.05 mm

ELECTRICAL CHARACTERISTICS

NORMAL STYLE

STYLE	KNP-25	KNP-50	KNP100	KNP200	KNP300	KNP400	KNP500	KNP700
Power Rating at 70 °C	1/4W	1/2W	1 W	2 W	3W	4W	5 W	7W
Dielectric Withstanding Voltage	250V	300V	400V					
Resistance Range	0.1 Ω ~47 Ω		0.1 Ω ~100 Ω	0.1 Ω ~330 Ω	0.1 Ω ~560 Ω	0.1 Ω ~1K Ω		
Operating Temp. Range	- 40°C to + 200°C							
Temperature Coefficient	±300ppm/°C							

MINIATURE STYLE

STYLE	KNP50S	KNP1WS	KNP2WS	KNP3WS	KNP5WS	KNP7WS
Power Rating at 70 °C	1/2W	1 W	2 W	3 W	5 W	7 W
Dielectric Withstanding Voltage	200V	300V	400V			
Resistance Range	0.1 Ω ~47 Ω		0.1 Ω ~100 Ω	0.1 Ω ~330 Ω	0.1 Ω ~560 Ω	0.1 Ω ~1K Ω
Operating Temp. Range	- 40°C to + 200°C					
Temperature Coefficient	±300ppm/°C					

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

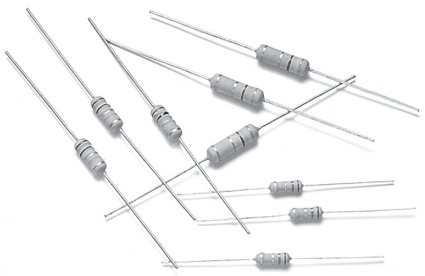
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05 Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100M Ω
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05 Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±5%+0.05 Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1.0%+0.05 Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1.0%+0.05 Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Wire Wound Resistors

Flame-Proof & Non Inductive Type

Normal & Miniature Style [NKN Series]



INTRODUCTION

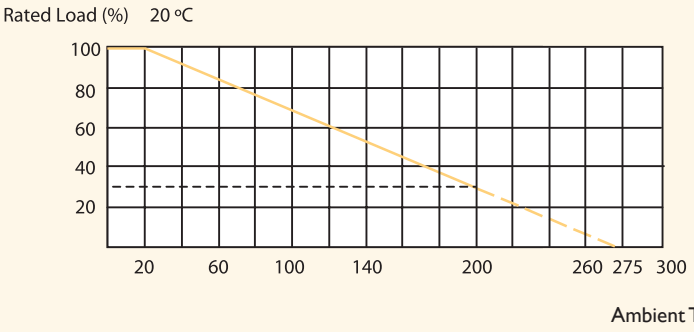
The resistor element is a resistive wire which is wound in a single layer on a ceramic rod or fiber-glass, tinned connecting wires of electrolytic copper are welded to the end-caps. The ends of the resistance wire and the leads are connected to the caps by welding. The resistors are coated with layers of green color flame proof lacquer. The 5th color band is black to represent NKN series.

FEATURES

Power Rating	1/2W, 1W, 2W, 3W, 4W, 5W, 7W
Resistance Tolerance	±1%, ±5%
T.C.R.	±300ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

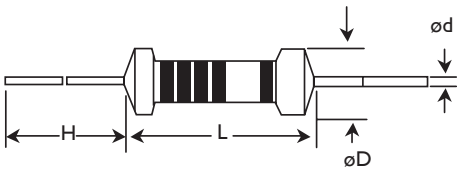
DERATING CURVE

For resistors operated in ambient temperatures above 20°C , power rating must be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



The 5th is black color band for NKN 5% series

STYLE		DIMENSION			
Normal	**Miniature**	**L**	**øD**	**H**	**ød**
NKN-50	NKN1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
NKN100	NKN2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
NKN200	NKN3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05
NKN300	NKN5WS	17.5±1.0	6.5±0.5	32±2.0	0.8±0.05
NKN400					
NKN500	NKN7WS	24.5±1.0	8.0±0.5	38±2.0	0.8±0.05

* NKN1WS (for MB Type) ød = 0.8±0.05 mm

ELECTRICAL CHARACTERISTICS

NORMAL STYLE

STYLE	NKN-50	NKN100	NKN200	NKN300	NKN400	NKN500
Power Rating at 70 °C	1/2W	1 W	2 W	3 W	4W	5 W
Dielectric Withstanding Voltage	250V	400V				
Resistance Range	0.1 Ω ~5 Ω	0.1 Ω ~10 Ω	0.1 Ω ~22 Ω	0.1 Ω ~27 Ω		0.1 Ω ~33 Ω
Operating Temp. Range	- 40°C to + 200°C					
Temperature Coefficient	±300ppm/°C					

MINIATURE STYLE

STYLE	NKN1WS	NKN2WS	NKN3WS	NKN5WS	NKN7WS
Power Rating at 70 °C	1 W	2 W	3 W	5 W	7 W
Dielectric Withstanding Voltage	250V	400V			
Resistance Range	0.1 Ω ~5 Ω	0.1 Ω ~10 Ω	0.1 Ω ~22 Ω	0.1 Ω ~27 Ω	0.1 Ω ~33 Ω
Operating Temp. Range	- 40°C to + 200°C				
Temperature Coefficient	±300ppm/°C				

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

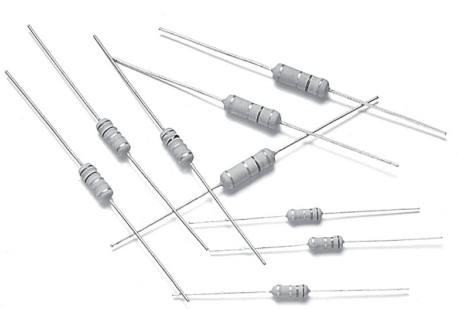
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05 Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100M Ω
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05 Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±5%+0.05 Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1.0%+0.05 Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1.0%+0.05 Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Fusible Wire Wound Resistors

Flame-Proof Type

Normal & Miniature Style [FKN Series]



INTRODUCTION

The resistor element is a resistive wire which is wound in a single layer on a ceramic rod or fiber-glass, tinned connecting wires of electrolytic copper are welded to the end-caps. The ends of the resistance wire and the leads are connected to the caps by welding. The resistors are coated with layers of green color flame proof lacquer. Overload protection without risk of fire. Wide range of overload currents.

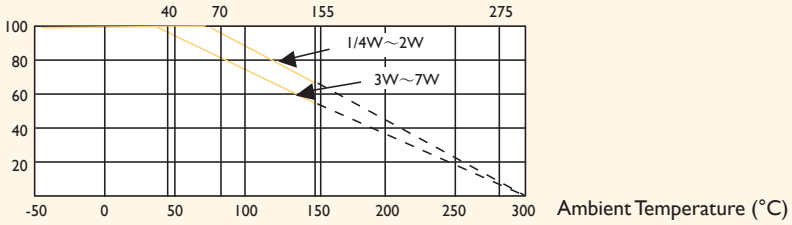
FEATURES

Power Rating	1/4W, 1/2W, 1W, 2W, 3W, 4W, 5W, 7W
Resistance Tolerance	±1%, ±5%
T.C.R.	±350ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

DERATING CURVE

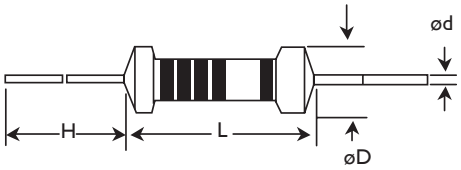
For resistors operated in ambient temperatures above 20°C , power ratingmust be derated in accordance with the curve below.

Rated Load (%)



DIMENSIONS

Unit : mm



The 5th is white color band for FKN 5% series

STYLE		DIMENSION			
Normal	**Miniature**	**L**	**øD**	**H**	**ød**
FKN-25	FKN50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
FKN-50	FKN1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
FKN100	FKN2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
FKN200	FKN3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05
FKN300 FKN400	FKN5WS	17.5±1.0	6.5±0.5	32±2.0	0.8±0.05
FKN500	FKN7WS	24.5±1.0	8.0±0.5	38±2.0	0.8±0.05

* FKN1WS (for MB Type) ød = 0.8±0.05 mm

ELECTRICAL CHARACTERISTICS

NORMAL STYLE

STYLE	FKN-25	FKN-50	FKN100	FKN200	FKN300	FKN400	FKN500
Power Rating at 70 °C	1/4W	1/2W	1 W	2 W	3W	4 W	5 W
Dielectric Withstanding Voltage	200V	300V					
Resistance Range	1 Ω ~22 Ω	0.1 Ω ~47 Ω	0.1 Ω ~100 Ω	0.1 Ω ~150 Ω	0.1 Ω ~330 Ω		0.1 Ω ~390 Ω
Operating Temp. Range	- 40°C to + 155°C						
Temperature Coefficient	±350ppm/°C						

MINIATURE STYLE

STYLE	FKN50S	FKN1WS	FKN2WS	FKN3WS	FKN5WS	FKN7WS
Power Rating at 70 °C	1/2W	1 W	2 W	3W	5 W	7 W
Dielectric Withstanding Voltage	200V	300V				
Resistance Range	1 Ω ~22 Ω	0.1 Ω ~47 Ω	0.1 Ω ~100 Ω	0.1 Ω ~150 Ω	0.1 Ω ~330 Ω	0.1 Ω ~390 Ω
Operating Temp. Range	- 40°C to + 155°C					
Temperature Coefficient	±350ppm/°C					

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

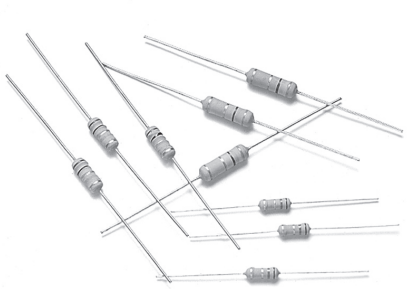
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05 Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100MΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05 Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on 0.5 Hrs. off)	±5%+0.05 Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1.0%+0.05 Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1.0%+0.05 Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Power Wire Wound Resistors

Flame-Proof Type

High Power Style [PNP Series]



INTRODUCTION

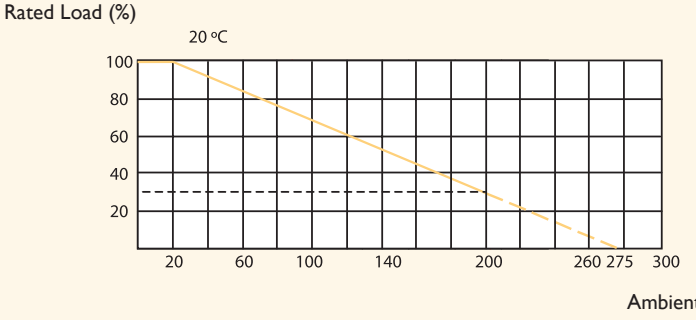
The resistor element is a resistive wire which is wound in a single layer on a ceramic rod or fiber-glass, tinned connecting wires of electrolytic copper are welded to the end-caps. The ends of the resistance wire and the leads are connected to the caps by welding. The resistors are coated with layers of green color flame proof lacquer. High power in small packages,

FEATURES

Power Rating	1W, 2W, 3W, 4W
Resistance Tolerance	±5%
T.C.R.	±300ppm/°C
Flameproof Multi-layer Coating Meets	UL-94V-0
Flameproof Feature Meets Overload Test	UL-1412

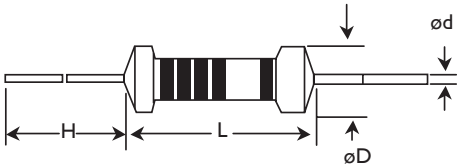
DERATING CURVE

For resistors operated in ambient temperatures above 20°C , power ratingmust be derated in accordance with the curve below.



DIMENSIONS

Unit : mm



The 5th is violet color band for PNP series

STYLE	DIMENSION			
Ultra Miniature	**L**	**øD**	**H**	**ød**
PNP100	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
PNP200	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
PNP300	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
PNP400	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

ELECTRICAL CHARACTERISTICS

STYLE	PNP100	PNP200	PNP300	PNP400
Power Rating at 70 °C	1 W	2 W	3W	4 W
Dielectric Withstanding Voltage	300V			
Resistance Range	0.1 Ω ~ 33 Ω	0.1 Ω ~ 100 Ω	0.1 Ω ~ 150 Ω	0.1 Ω ~ 330 Ω
Operating Temp. Range	-40°C to + 200°C			
Temperature Coefficient	±300ppm/°C			

* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

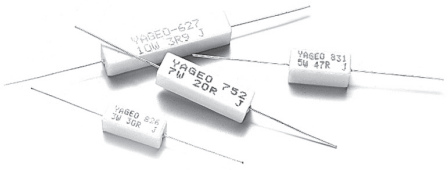
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05 Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100M Ω
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05 Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on,0.5 Hrs. off)	±5%+0.05 Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±1.0%+0.05 Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1.0%+0.05 Ω
Overload Flame Retardant	JIS-C-5202 7.12	4 Times RCWV for 1 Minute	No evidence of flaming or arcing

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Cement Resistors

Axial Lead Type

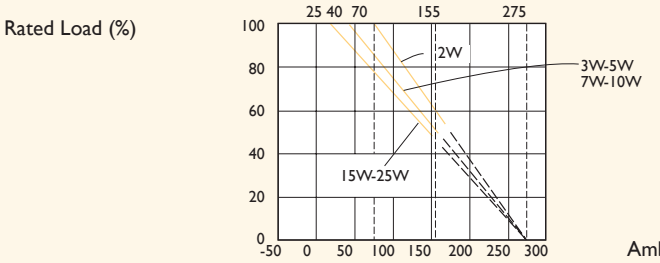
Normal Style [SQP Series]
Non-Inductive Style [NSP Series]



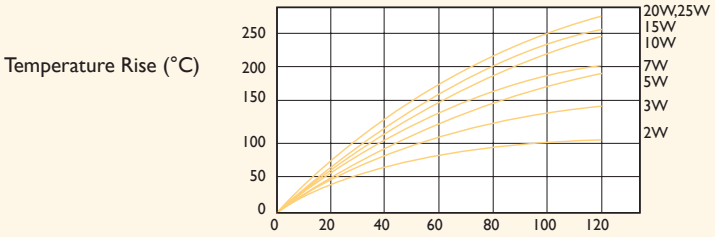
FEATURES

Power Rating	2W, 3W, 5W, 7W, 10W, 15W, 20W, 25W
Resistance Tolerance	±5%
T.C.R.	±300ppm/°C

DERATING CURVE



TEMPERATURE RISE

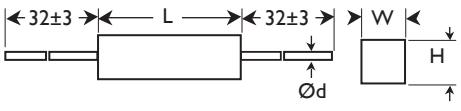


INTRODUCTION

- The materials used and the construction techniques ensure excellent flame resistance, arc resistance and moisture resistances as well as self-extinguishing capabilities. They will withstand the most rigorous loading test.

- As resistors in radio and television receivers, the hazardous conditions of smoking and redheat can be completely prevented by the proper choice of power resistors.

DIMENSIONS



Unit : mm

STYLE		DIMENSION			
Normal	**Non-Ind.**	**L**	**W**	**H**	**ød**
SQP200	NSP200	18±1.0	7.0±1.0	7.0±1.0	0.8±0.05
SQP300	NSP300	22±1.5	8.0±1.0	8.0±1.0	0.8±0.05
SQP500	NSP500	22±1.5	9.5±1.0	9.0±1.0	0.8±0.05
SQP700	NSP700	35±1.5	9.5±1.0	9.0±1.0	0.8±0.05
SQP10A	NSP10A	48±1.5	9.5±1.0	9.0±1.0	0.8±0.05
SQP15A	NSP15A	48±1.5	12.5±1.0	12.5±1.0	0.8±0.05
SQP20A	NSP20A	60±2.0	12.5±1.0	12.5±1.0	0.8±0.05
SQP25A	NSP25A	60±2.0	14.0±1.5	13.0±1.5	0.8±0.05

ELECTRICAL CHARACTERISTICS

STYLE	SQP200	SQP300	SQP500	SQP700	SQP10A	SQP15A	SQP20A	SQP25A
Power Rating at 70 °C	2W	3W	5W	7W	10W	15W	20W	25W
Maximum Working Voltage	250V	350V		500V				
Maximum Overload Voltage	500V	700V		1000V				
Dielectric Withstanding Voltage	500V	700V		1000V				
Resistance range (Wirewound)	0.1Ω~36Ω	0.18Ω~180Ω		0.39Ω~430Ω	0.62Ω~620Ω	0.82Ω~820Ω	1Ω~1KΩ	1.2Ω~1K5Ω
Resistance range (Metal Oxide Film)	39Ω~47KΩ	100Ω~100KΩ	100Ω~200KΩ		100Ω~100KΩ			
Operating Temp. Range	- 55°C to + 155°C							
Temperature Coefficient	±300ppm/°C							

* Below or over this resistance range on request.
* Non-Inductive type up to 50Ω only.

ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100MΩ
Solderability	JIS-C-5202 6.5	260°C±5°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±2.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±2.0%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±1.0%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Cement Resistors

Vertical Lead Type

Normal Style [SQM Series]
Non-Inductive Style [NSM Series]

INTRODUCTION

- The materials used and the construction techniques ensure excellent flame resistance, arc resistance and moisture resistances as well as self-extinguishing capabilities. They will withstand the most rigorous loading test.

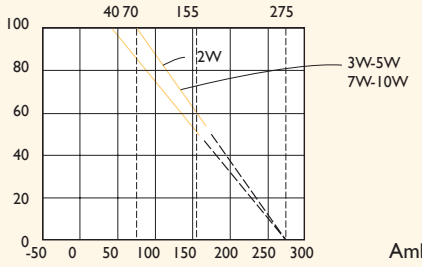
- As resistors in radio and television receivers, the hazardous conditions of smoking and redheat can be completely prevented by the proper choice of power resistors.

FEATURES

Power Rating	2W, 3W, 5W, 7W, 10W
Resistance Tolerance	±5%
T.C.R.	±300ppm/°C

DERATING CURVE

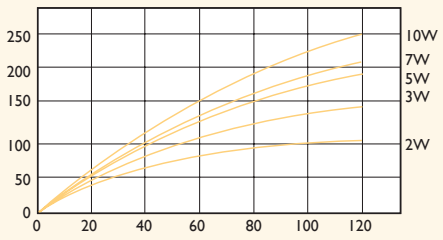
Rated Load (%)



Ambient Temperature (°C)

TEMPERATURE RISE

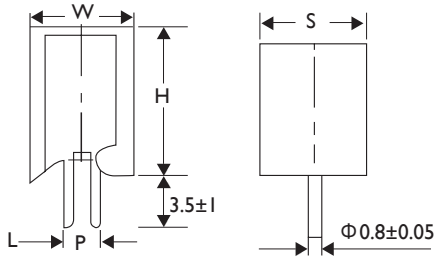
Temperature Rise (°C)



Rated Load (%)

DIMENSIONS

Unit : mm



STYLE		DIMENSION			
Normal	**Non-Ind.**	**H**	**W**	**S**	**P**
SQM200	NSM200	20±1.5	11.0±1.0	7.0±1.0	5^{+2-1}
SQM300	NSM300	25±1.5	12.0±1.0	8.0±1.0	5^{+2-1}
SQM500	NSM500	25±1.5	13.0±1.0	9.0±1.0	5^{+2-1}
SQM700	NSM700	39±1.5	13.0±1.0	9.0±1.0	5^{+2-1}
SQM10A	NSM10A	51±1.5	13.0±1.0	9.0±1.0	5^{+2-1}
SQM10S	NSM10S	35±1.5	16.0±1.0	12.0±1.0	5^{+2-1}

ELECTRICAL CHARACTERISTICS

STYLE	SQM200	SQM300	SQM500	SQM700	SQM10A	SQM10S
Power Rating at 70 °C	2W	3W	5W	7W	10W	
Maximum Working Voltage	250V	350V		500V		
Maximum Overload Voltage	500V	700V		1000V		
Dielectric Withstanding Voltage	500V	700V		1000V		
Resistance range (Wirewound)	0.1Ω~36Ω	0.18Ω~180Ω		0.39Ω~430Ω	0.62Ω~620Ω	0.39Ω~430Ω
Resistance range (Metal Oxide Film)	39Ω~47KΩ	100Ω~100KΩ	100Ω~200KΩ			51Ω~100KΩ
Operating Temp. Range	- 55°C to + 155°C					
Temperature Coefficient	±300ppm/°C					

* Below or over this resistance range on request.
* Non-Inductive type up to 50Ω only.

ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100MΩ
Solderability	JIS-C-5202 6.5	260°C±5°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±2.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±2.0%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±1.0%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Cement Resistors

Radial Terminals Type

Normal Style [SQZ Series]
Non-Inductive Style [NSZ Series]

INTRODUCTION

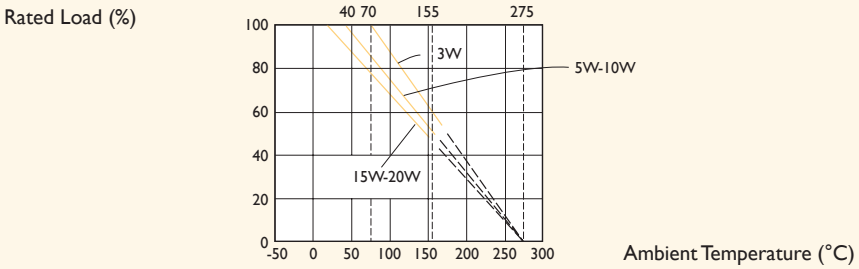
- The materials used and the construction techniques ensure excellent flame resistance, arc resistance and moisture resistances as well as self-extinguishing capabilities. They will withstand the most rigorous loading test.

- As resistors in radio and television receivers, the hazardous conditions of smoking and redheat can be completely prevented by the proper choice of power resistors.

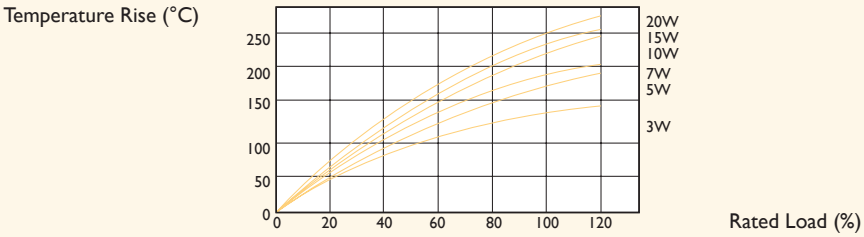
FEATURES

Power Rating	3W, 5W, 7W, 10W, 15W, 20W
Resistance Tolerance	±5%
T.C.R.	±300ppm/°C

DERATING CURVE

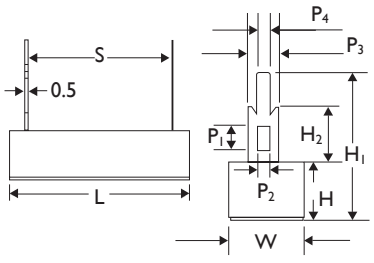


TEMPERATURE RISE



DIMENSIONS

Unit : mm



STYLE		DIMENSION									
Normal	**Non-Ind.**	**L**	**H**	**W**	**S**	**H_1**	**H_2**	**P_1**	**P_2**	**P_3**	**P_4**
SQZ300	NSZ300	24.0±1.5	9.0±1	9.0±1	10.0±1	24.0±1	9.5±1.0	4.0±0.2	2.0±0.2	5.0±0.2	1.4±0.1
SQZ500	NSZ500	27.0±1.5	9.5±1	9.5±1	15.0±1	24.0±1	9.5±1.0	4.0±0.2	2.0±0.2	5.0±0.2	1.4±0.1
SQZ700	NSZ700	35.0±1.5	9.5±1	9.5±1	22.5±1	24.0±1	9.5±1.0	4.0±0.2	2.0±0.2	5.0±0.2	1.4±0.1
SQZ10A	NSZ10A	48.0±1.5	9.5±1	9.5±1	32.5±1	24.0±1	9.5±1.0	4.0±0.2	2.0±0.2	5.0±0.2	1.4±0.1
SQZ15A	NSZ15A	48.0±1.5	12.5±1	12.5±1	32.5±1	34.5±1	15.0±1.5	7.0±0.2	6.0±0.2	10.0±0.2	2.7±0.1
SQZ20A	NSZ20A	63.5±2.0	12.5±1	12.5±1	42.5±1	34.5±1	15.0±1.5	7.0±0.2	6.0±0.2	10.0±0.2	2.7±0.1

* Below or over the "S" dimension on request.

ELECTRICAL CHARACTERISTICS

STYLE	SQZ300	SQZ500	SQZ700	SQZ10A	SQZ15A	SQZ20A
Power Rating at 70 °C	3W	5W	7W	10W	15W	20W
Maximum Working Voltage	250V	350V	500V			
Maximum Overload Voltage	500V	700V	1000V			
Dielectric Withstanding Voltage	500V	700V	1000V			
Resistance range (Wirewound)	0.1Ω~36Ω	0.27Ω~300Ω	0.39Ω~430Ω	0.56Ω~620Ω	0.75Ω~750Ω	1Ω~1KΩ
Resistance range (Metal Oxide Film)	39Ω~100KΩ	100Ω~200KΩ			100Ω~100KΩ	
Operating Temp. Range	- 55°C to + 155°C					
Temperature Coefficient	±300ppm/°C					

* Below or over this resistance range on request.
* Non-Inductive type up to 50Ω only.

ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100MΩ
Solderability	JIS-C-5202 6.5	260°C±5°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±2.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±2.0%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±1.0%+0.05Ω

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Ceramic Metal Plate Resistors

Radial Lead Type

Normal Style [SLR]

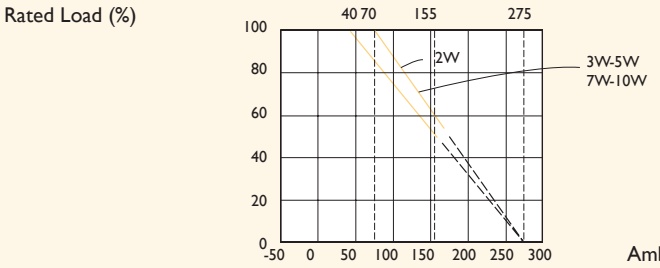
INTRODUCTION

- The materials used and the construction techniques ensure excellent flame resistance, arc resistance and moisture resistances as well as self-extinguishing capabilities. They will withstand the most rigorous loading test.
- As resistors in radio and television receivers, the hazardous conditions of smoking and redheat can be completely prevented by the proper choice of power resistors.

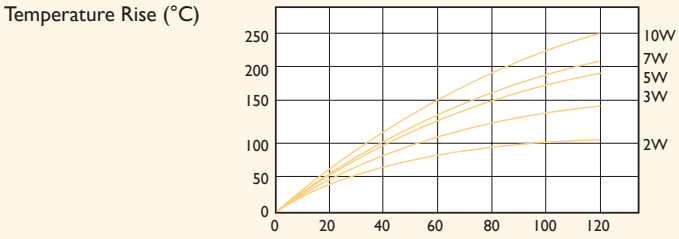
FEATURES

Power Rating	2W, 3W, 5W, 7W, 10W
Resistance Tolerance	±5%, ±10%
T.C.R.	±250ppm/°C

DERATING CURVE

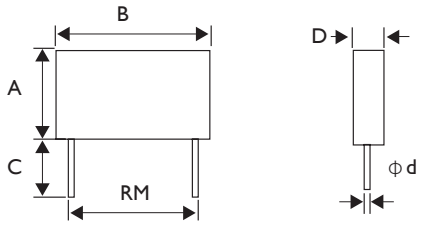


TEMPERATURE RISE



DIMENSIONS

Unit : mm



STYLE	DIMENSION					
Normal	**A**	**B**	**C**	**D**	**ød**	**RM**
SLR200	8±1	13±1	3.5±1	5±1	0.6±0.05	9±1
SLR300	13±1	13±1	3.5±1	5±1	0.6±0.05	8±1
SLR500	18±1	14±1	3.5±1	5±1	0.6±0.05	10±1
SLR700	18±1	26±1	3.5±1	5±1	0.8±0.05	20±1
SLR10A	20±1	26±1	3.5±1	5±1	0.8±0.05	20±1

Note :

ELECTRICAL CHARACTERISTICS

STYLE	SLR200	SLR300	SLR500	SLR700	SLR10A
Power Rating at 70 °C	2W	3W	5W	7W	10W
Maximum Working Voltage	250V	350V		500V	
Maximum Overload Voltage	500V	700V		1000V	
Dielectric Withstanding Voltage	500V	700V		1000V	
Resistance range	0.10Ω~0.68Ω	0.05Ω~1Ω	0.05Ω~3.3Ω		
Operating Temp. Range	- 55°C to + 155°C				
Temperature Coefficient	±250ppm/°C				

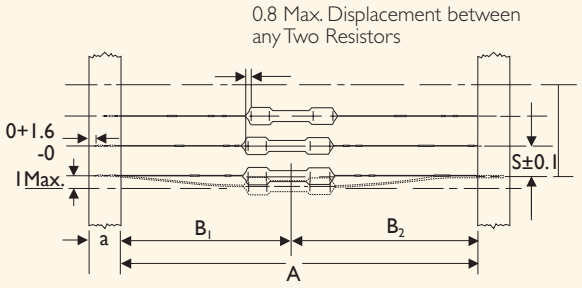
* Below or over this resistance range on request.

ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2.0%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1GΩ
Solderability	JIS-C-5202 6.5	260°C ±5°C for 5 ±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	IPA for 1 Min. with Ultrasonic	No deterioration of Coatings and Markings
Terminal Strength	JIS-C-5202 6.1	Direct load for 10 Sec. In the Direction of the Terminal Leads	≧2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. On, 25 Sec. off)	±2.0%+0.05Ω
Load Life in Humidity	JIS-C-5202 7.9	40±2°C , 90~95% RH at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05Ω
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1,000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±5%+0.05Ω
Temperature Cycling	JIS-C-5202 7.4	-55°C→Room Temp.→+155°C→Room Temp. for 5 Cycles	±2.0%+0.05Ω
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C ±10°C for 3±0.5 Seconds	±1.0%+0.05

* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

PACKING METHODS



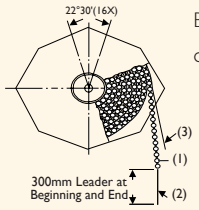
Bandolier for Axial Leads

The resistors are supplied on bandolier; either 1000 resistors in ammopack or 5000 resistors on reel.

Unit : mm

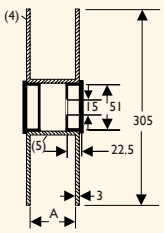
STYLE		DIMENSIONS				
Normal	**Miniature**	**a**	**A**	**B1-B2**	**S (Spacing)**	**T (Max. Deviation of Spacing)**
TYPE-12	TYPE25S/204	6±0.5	52.4±1.5	1.2	5	
			26.0±1.5	1.0		
TYPE-25	TYPE50S/207	6±0.5	52.4±1.5	1.2	5	
			26.0±1.5	1.0		
TYPE-50	TYPE1WS	6±0.5	52.4±1.5	1.2	5	1mm Per 10 Spacings, 0.5mm Per 5 Spacings
TYPE100	TYPE2WS	6±0.5	73.0±1.5	1.5	5	
			52.4±1.5	1.2		
TYPE200	TYPE3WS	6±0.5	73.0±1.5	1.5	10	
KNP300	KNP5WS		52.4±1.5	1.2		
RSF300	RSF5WS	6±0.5	91.0±1.5	1.5	10	
RSF500/KNP500	KNP7WS		73.0±1.5	1.5		

TAPE ON REEL PACKING

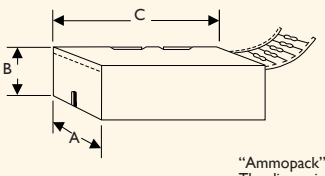


Bandoliers can be reeled; dimension a differ with type.

(1) Resistor
(2) Bandolier
(3) Paper
(4) Flange
(5) Cylinder



TAPE ON BOX PACKING



Bandoliers may also be supplied in a cardboard box ("ammopack").

"Ammopack" is an abbreviation of "ammunition packing"
The dimensions of A-B-C vary with type and quantity.

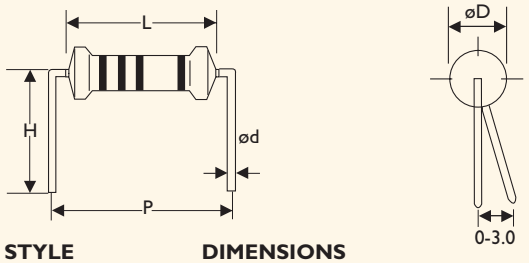
Unit : mm/pcs

STYLE		TAPE ON REEL		TAPE ON BOX			
Normal	**Miniature**	**Across Flange (A)**	**QTY Per Reel**	**W(A)**	**H (B)**	**L (C)**	**QTY Per Box**
TYPE-12	TYPE25S/204	72	5,000	78/81	24/70	260	2,000/5,000
TYPE-25	TYPE50S/207	48/72	5,000	78/81	24/104	260	1,000/5,000
TYPE-50	TYPE1WS	72	2,500	73	45	258	1,000
TYPE100	TYPE2WS	95	2,000	103	78	260	1,000
TYPE200	TYPE3WS	95	1,000	103	94	260	1,000
KNP300	KNP5WS	95	1,000	103	78	260	500
RSF300 RSF500/KNP500	RSF5WS KNP7WS	95	250	116	79	255	250

Note :

SPECIAL TYPE (FORMING DIMENSIONS)

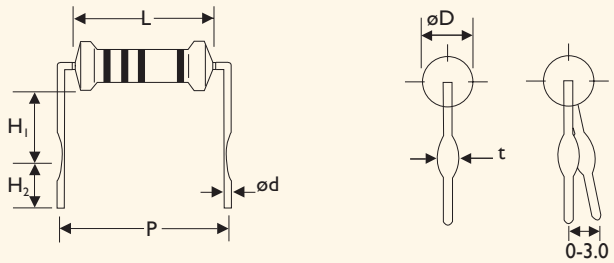
M TYPE



Unit : mm

STYLE	DIMENSIONS					
Normal	**Miniature**	**L**	**P**	**øD**	**ød**	**H**
TYPE-12	TYPE25S	3.4±0.3	6.0±1	1.9±0.2	0.45±0.05	10.0±1
TYPE-25	TYPE50S	6.3±0.5	10.0±1	2.4±0.2	0.55±0.05	10.0±1
TYPE-50	TYPE1WS	9.0±0.5	12.5±1	3.3±0.3	0.55±0.05	10.0±1
TYPE100	TYPE2WS	11.5±1.0	15.0±1	4.5±0.5	0.8±0.05	12.5±1
TYPE200	TYPE3WS	15.5±1.0	20.0±1	5.0±0.5	0.8±0.05	15.0±1

MB TYPE

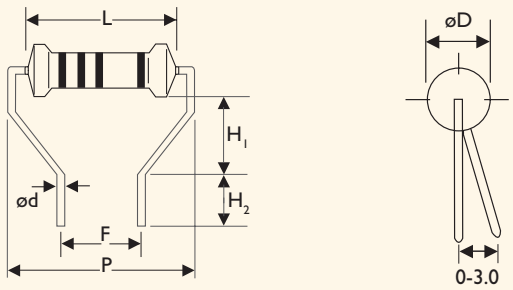


Unit : mm

STYLE		DIMENSIONS						
Normal	**Miniature**	**L**	**P**	**øD**	**ød**	**H1**	**H2**	**t**
TYPE-25	TYPE50S	6.3±0.5	10.0±1	2.4±0.2	0.55±0.05	6.0±1	5.0±1	1.2±0.2
TYPE-50	-	9.0±0.5	12.5±1	3.3±0.3	0.55±0.05	6.0±1	5.0±1	1.2±0.2
-	TYPE1WS	9.0±0.5	12.5±1	3.3±0.3	0.8±0.05	6.0±1	5.0±1	1.4±0.2
TYPE100	TYPE2WS	11.5±1.0	15.0±1	4.5±0.5	0.8±0.05	6.0±1	5.0±1	1.4±0.2
TYPE200	TYPE3WS	15.5±1.0	20.0±1	5.0±0.5	0.8±0.05	10.0±1	5.0±1	1.4±0.2
TYPE300	TYPE5WS	24.5±1.0	30.0±1	8.0±0.5	0.8±0.05	15.0±1	5.0±1	1.4±0.2
TYPE500	-	24.5±1.0	30.0±1	8.0±0.5	0.8±0.05	15.0±1	5.0±1	1.4±0.2

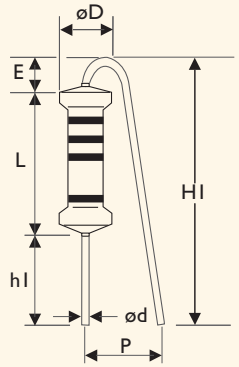
Note :

MR TYPE



STYLE	DIMENSIONS							Unit : mm
Normal	**Miniature**	**L**	**P**	**F**	**øD**	**ød**	**H1**	**H2**
TYPE-50	TYPE1WS	9.0±0.5	14.5±1	7.0±0.5	3.3±0.3	0.55±0.05	7.0±1	5.0±1
TYPE100	TYPE2WS	11.5±1.0	17.5±1	7.0±0.5	4.5±0.5	0.8±0.05	8.0±1	5.0±1
TYPE200	TYPE3WS	15.5±1.0	21.5±1	7.0±0.5	5.0±0.5	0.8±0.05	9.0±1	5.0±1

F TYPE



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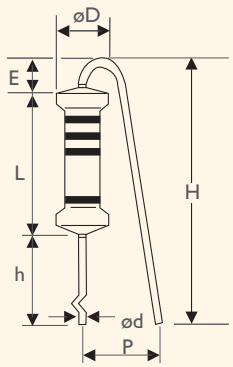

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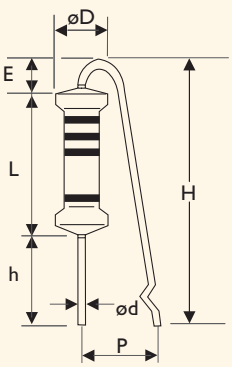

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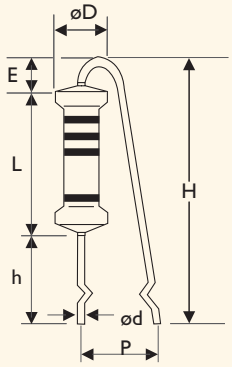


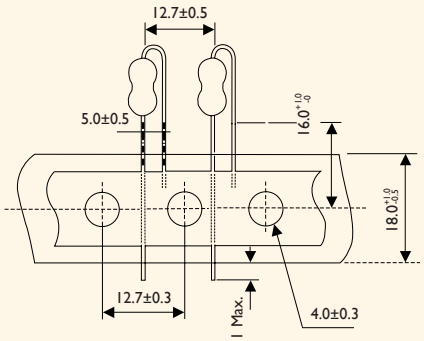
STYLE	DIMENSIONS								Unit : mm
Normal	**Miniature**	**L**	**P**	**øD**	**ød**	**h**	**H Max.**	**h1**	**H1Max.**	**E Max.**
TYPE100	TYPE2WS	11.5±1	6±1	4.5±0.5	0.8±0.05	10.0±1	25	5.0±1	20	3.5
TYPE200	TYPE3WS	15.5±1	6±1	5.0±0.5	0.8±0.05	10.0±1	30	5.0±1	25	3.5

*TYPE-25/50S is available.

Note :

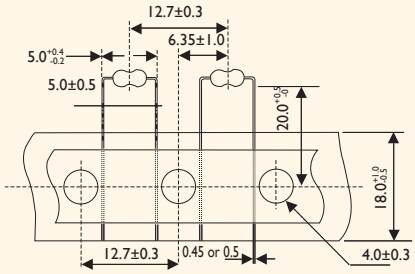
FT TYPE FORMING FOR TAPING

Rated Watts 1/4W, 1/2WS & 0.6W
Body Dimension : L = 6.3±0.5mm
øD = 2.4±0.2mm
Rated Watts : 1/2W & 1WS
Body Dimension : L = 9±0.5mm
øD = 3.3±0.3mm



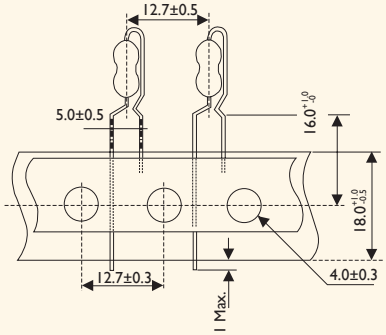
MT TYPE FORMING FOR TAPING

Rated Watts 1/6W, 1/4WS & 0.4W
Body Dimension : L = 3.4±0.3mm
øD = 1.9±0.2mm



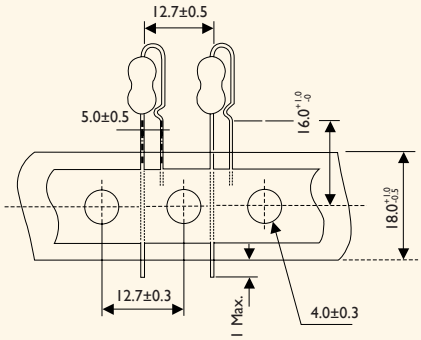
PN TYPE FORMING FOR TAPING

Rated Watts 1/4W, 1/2WS & 0.6W
Body Dimension : L = 6.3±0.5mm
øD = 2.4±0.2mm
Rated Watts : 1/2W & 1WS
Body Dimension : L = 9±0.5mm
øD = 3.3±0.3mm



AV TYPE FORMING FOR TAPING

Rated Watts 1/4W, 1/2WS & 0.6W
Body Dimension : L = 6.3±0.5mm
øD = 2.4±0.2mm
Rated Watts : 1/2W & 1WS
Body Dimension : L = 9±0.5mm
øD = 3.3±0.3mm



Note :

EXPLANATIONS OF ORDERING CODE

MFR	-12	F	T	F	52-	100R

MFR

Code 1~3
Series Name
See Index

-12

Code 4~6
Power Rating

-05	= ød0.5mm
-06	= ød0.6mm
-07	= ød0.7mm
-08	= ød0.8mm
-10	= ød1.0mm
-14	= ød1.4mm
-12	= 1/6W
-25	= 1/4W
25S	= 1/4WS
-50	= 1/2W
50S	= 1/2WS
100	= 1W
1WS	= 1WS
200	= 2W
2WS	= 2WS
204	= 0.4W
207	= 0.6W
300	= 3W
3WS	= 3WS
3WM	= 3WM
400	= 4W
500	= 5W
5WS	= 5WS
5SS	= 5WSS
700	= 7W
7WS	= 7WS
10A	= 10W
20A	= 20W
30A	= 30W
40A	= 40W
50A	= 50W
10S	= 10WS
15A	= 15W
25A	= 25W

F

Code 7
Tolerance

A	= ±0.05 %
B	= ±0.1 %
C	= ±0.25%
D	= ±0.5 %
F	= ±1 %
G	= ±2 %
J	= ±5 %
K	= ±10 %
-	= Base on Spec .

T

Code 8
Packing Style

T	= Tape/Box
R	= Tape/Reel
B	= Bulk

F

Code 9
Temperature Coefficient of Resistance

-	= Base on Spec.
A	= ±5ppm/℃
B	= ±10ppm/℃
C	= ±15ppm/℃
D	= ±25ppm/℃
E	= ±50ppm/℃
F	= ±100ppm/℃
G	= ±200ppm/℃
H	= ±250ppm/℃
I	= ±300ppm/℃
J	= ±350ppm/℃

52-

Code 10~12
Forming Type

26-	= 26mm
52-	= 52.4mm
73-	= 73mm
81-	= 81mm
91-	= 91mm
F	= F Type
FK	= FK Type
FKK	= FKK Type
FFK	= F-form Kink
M	= M-Type Forming
MB	= M-form W/flat
MK	= M-form Kink
MT	= MT Type Forming
MR	= MR Type
AV	= AVIsert
PN	= PANAsert

100R

Code 13~17
Resistance Value

0R1	= 0.1
100R	= 100
10K	= 10000
10M	= 10000000

Exceptions:

1) Code 8: special packing style code:
   - Cement series:
     B: Bulk with wirewound or metal oxide sub-assembly for resistance value
     W: Bulk with wirewound sub-assembly for resistance value.
     M: Bulk with metal oxide sub-assembly for resistance value.

2) Code 10-12: without forming code
   - Cement series:
     Example: SQP500JM-10R

3) Code 13-17: without resistance value code
   - JPW series:
     Example: JPW-06-T-52-

Note :

STANDARD PACKAGING for BULK

POWER RATING	PCS/PER INNER BOX	BAG/PER INNER BOX	PCS/PER BAG
1/6W, 1/4WS, 0.4W	2,000	10	200
1/4W, 1/2WS, 0.6W	1,000	5	200
1/2W, 1WS	1,000	5	200
1W, 2WS	1,000	10	100
2W, 3WS	1,000	10	100
3W	500	10	50
5W	500	10	50
7W	500	10	50

LEAD TO LEAD TAPING

Unit : mm

POWER RATING	STANDARD LEAD LENGTH	MINIATURE LEAD LENGTH
1/6W, 1/4WS	52	26
1/4W, 1/2WS	52	26
0.4W	52	26
0.6W	52	26
1/2W, 1WS	52	N/A
1W, 2WS	73 or 62	52
2W, 3WS	73	52
3WM	73	52
5SS	73	52
3W, 4W, 5WS	91	73
5W	91	73
7W	91	73

* Lead length 91mm didn't do T/R.

EXCEPTION

Unit : mm

SERIES	POWER RATING	STANDARD LEAD LENGTH	MINIATURE LEAD LENGTH
KNP/NKN	3W, 4W, 5WS	73	52
KNP/NKN/RSF	5W, 7W on T/R	73	73

Note :

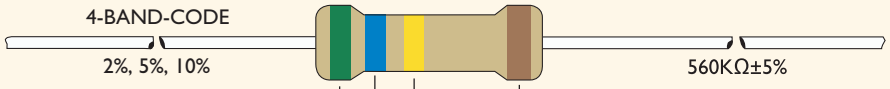
STANDARD PACKAGING

WATT	PACKAGE	Q'TY (Pcs)	WEIGHT (Kg)	CARTON Q'TY (Pcs)	NW/GW (Kg)	CARTON (No.)	CARTON SIZE (cm)	CUBIC FIT (Cu.ft.)
1/6W	Tape/Reel	5,000	1.1	50,000	11/13	E1	60×32×43	3
1/4WS	Tape/Box	2,000	0.3	120,000	18/20	E3	44×28×36	1.6
0.4W	Tape/Box	5,000	0.74	100,000	15/17	E3	44×28×36	1.6
	Bulk	2,000	0.25	140,000	18/20	E3	44×28×36	1.6
1/4W	Tape/Reel	5,000	1.6	50,000	16/18	E1	60×32×43	3
1/2WS	Tape/Box	1,000	0.25	60,000	15/17	E3	44×28×36	1.6
0.6W	Tape/Box	5,000	1.25	75,000	19/21	E3	44×28×36	1.6
	Bulk	1,000	0.23	70,000	16/18	E3	44×28×36	1.6
1/2W	Tape/Reel	2,500	1.3	25,000	13/15	E1	60×32×43	3
1WS	Tape/Reel	3,000	1.6	30,000	16/18	E1	60×32×43	3
	Tape/Box	1,000	0.43	30,000	13/15	E3	44×28×36	1.6
	Bulk	1,000	0.4	40,000	16/18	E3	44×28×36	1.6
1W	Tape/Reel	2,000	2.2	20,000	22/24	E2	60×32×54.5	3.8
2WS	Tape/Box	1,000	0.9	16,000	14/16	E3	44×28×36	1.6
	Bulk	1,000	0.9	16,000	14/16	E3	44×28×36	1.6
	Forming	2,000	1.5	32,000	24/26	E3	44×28×36	1.6
2W	Tape/Reel	1,000	1.6	10,000	16/18	E2	60×32×54.5	3.8
3WS	Tape/Box	1,000	1.18	12,000	14/16	E5	28×46×30	1.4
	Bulk	1,000	1.12	16,000	18/20	E3	44×28×36	1.6
	Forming	1,000	1.02	16,000	16/18	E3	44×28×36	1.6
3W	Tape/Reel	500	2.2	5,000	22/24	E2	60×32×54.5	3.8
5W	Tape/Box	250	1.15	3,500	16/18	E3	44×28×36	1.6
5WS	Bulk	500	2	4,000	16/18	E6	42.5×42.5×19	1.2
5SS	Tape/Box	500		10,000	18/20			1.7
JPW-05	Tape/Reel	10,000	1.4	50,000	7/8	J2		
	Tape/Box	10,000	1.1	100,000	11/12	J1		
JPW-06	Tape/Reel	10,000	2	50,000	10/11	J2		
	Tape/Box	10,000	1.5	100,000	15/16	J1		
JPW-08	Tape/Reel	10,000	2.9	50,000	14/15	J2		

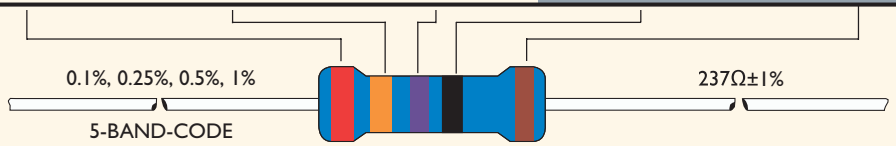
Note :

CEMENT RESISTORS PACKAGING

TYPE	POWER	BOX	CTN	NW	GW
(Unit)	(Watt)	(Pcs)	(Pcs)	(Kg)	(Kg)
SQP	2W	1,000	6,000	20	21
	3W	600	4,800	20	21
		500	4,000	18	19
	5W	500	4,000	20	21
	7W	250	2,000	18	19
	10W	250	2,000	20	21
	15W	150	900	18	19
	20W	100	600	16	17
SQM	2W	1,000	6,000	20	21
	3W	1,200	2,400	13	14
	5W	1,000	2,000	13	14
	7W	800	1,600	16	17
	10W	500	1,000	17	18
SQZ	5W	100	2,000	16	17
	7W	100	2,000	20	21
	10W	60	1,200	19	20
	15W	30	600	13	14
	20W	30	600	16	17
SLR	3W	1,000	8,000	17	18.3
	5W	1,000	8,000	27.2	28.5



COLOR	1ST BAND	2ND BAND	3RD BAND	MULTIPLIER	TOLERANCE	
BLACK	0	0	0	1Ω		
BROWN	1	1	1	10Ω	±1%	(F)
RED	2	2	2	100Ω	±2%	(G)
ORANGE	3	3	3	1KΩ		
YELLOW	4	4	4	10KΩ		
GREEN	5	5	5	100KΩ	±0.5%	(D)
BLUE	6	6	6	1MΩ	±0.25%	(C)
VIOLET	7	7	7	10MΩ	±0.10%	(B)
GREY	8	8	8		±0.05%	
WHITE	9	9	9			
GOLD				0.1	±5%	(J)
SILVER				0.01	±10%	(K)



STANDARD RESISTANCE VALUES FOR THE 10-TO-100 DECADE

(Also Usable in Decade Multiples or Sub-Multiples)

RESISTANCE TOLERANCE (±%)

0.1% 0.25% 0.5%	1%	2% 5% 10%	0.1% 0.25% 0.5%	1%	2% 5% 10%	0.1% 0.25% 0.5%	1%	2% 5% 10%	0.1% 0.25% 0.5%	1%	2% 5% 10%	0.1% 0.25% 0.5%	1%	2% 5% 10%	0.1% 0.25% 0.5%	1%	2% 5% 10%
10.0	10.0	10	14.7	14.7	-	21.5	21.5	-	31.6	31.6	-	46.4	46.4	-	68.1	68.1	68
10.1	-	-	14.9	-	-	21.8	-	-	32.0	-	-	47.0	-	47	69.0	-	-
10.2	10.2	-	15.0	15.0	15	22.1	22.1	22	32.4	32.4	-	47.5	47.5	-	69.8	69.8	-
10.4	-	-	15.2	-	-	22.3	-	-	32.8	-	-	48.1	-	-	70.6	-	-
10.5	10.5	-	15.4	15.4	-	22.6	22.6	-	33.2	33.2	33	48.7	48.7	-	71.5	71.5	-
10.6	-	-	15.6	-	-	22.9	-	-	33.6	-	-	49.3	-	-	72.3	-	-
10.7	10.7	-	15.8	15.8	-	23.2	23.2	-	34.0	34.0	-	49.9	49.9	-	73.2	73.2	-
10.9	-	-	16.0	-	16	23.4	-	-	34.4	-	-	50.5	-	-	74.1	-	-
11.0	11.0	11	16.2	16.2	-	23.7	23.7	-	34.8	34.8	-	51.1	51.1	51	75.0	75.0	75
11.1	-	-	16.4	-	-	24.0	-	24	35.2	-	-	51.7	-	-	75.9	-	-
11.3	11.3	-	16.5	16.5	-	24.3	24.3	-	35.7	35.7	-	52.3	52.3	-	76.8	76.8	-
11.4	-	-	16.7	-	-	24.6	-	-	36.1	-	36	53.0	-	-	77.7	-	-
11.5	11.5	-	16.9	16.9	-	24.9	24.9	-	36.5	36.5	-	53.6	53.6	-	78.7	78.7	-
11.7	-	-	17.2	-	-	25.2	-	-	37.0	-	-	54.2	-	-	79.6	-	-
11.8	11.8	-	17.4	17.4	-	25.5	25.5	-	37.4	37.4	-	54.9	54.9	-	80.6	80.6	-
12.0	-	12	17.6	-	-	25.8	-	-	37.9	-	-	55.6	-	-	81.6	-	-
12.1	12.1	-	17.8	17.8	-	26.1	26.1	-	38.3	38.3	-	56.2	56.2	56	82.5	82.5	82
12.3	-	-	18.0	-	18	26.4	-	-	38.8	-	-	56.9	-	-	83.5	-	-
12.4	12.4	-	18.2	18.2	-	26.7	26.7	-	39.2	39.2	39	57.6	57.6	-	84.5	84.5	-
12.6	-	-	18.4	-	-	27.1	-	27	39.7	-	-	58.3	-	-	85.6	-	-
12.7	12.7	-	18.7	18.7	-	27.4	27.4	-	40.2	40.2	-	59.0	59.0	-	86.6	86.6	-
12.9	-	-	18.9	-	-	27.7	-	-	40.7	-	-	59.7	-	-	87.6	-	-
13.0	13.0	13	19.1	19.1	-	28.0	28.0	-	41.2	41.2	-	60.4	60.4	-	88.7	88.7	-
13.2	-	-	19.3	-	-	28.4	-	-	41.7	-	-	61.2	-	-	89.8	-	-
13.3	13.3	-	19.6	19.6	-	28.7	28.7	-	42.2	42.2	-	61.9	61.9	62	90.9	90.9	91
13.5	-	-	19.8	-	-	29.1	-	-	42.7	-	-	62.6	-	-	92.0	-	-
13.7	13.7	-	20.0	20.0	20	29.4	29.4	-	43.2	43.2	43	63.4	63.4	-	93.1	93.1	-
13.8	-	-	20.3	-	-	29.8	-	-	43.7	-	-	64.2	-	-	94.2	-	-
14.0	14.0	-	20.5	20.5	-	30.1	30.1	30	44.2	44.2	-	64.9	64.9	-	95.3	95.3	-
14.2	-	-	20.8	-	-	30.5	-	-	44.8	-	-	65.7	-	-	96.5	-	-
14.3	14.3	-	21.0	21.0	-	30.9	30.9	-	45.3	45.3	-	66.5	66.5	-	97.6	97.6	-
14.5	-	-	21.3	-	-	31.2	-	-	45.9	-	-	67.3	-	-	98.8	-	-
E-192	E-96	E-24	E-192	E-96	E-24	E-192	E-96	E-24	E-192	E-96	E-24	E-192	E-96	E-24	E-192	E-96	E-24

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